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Published by A&P Electronic Media

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Cover Design by Aaron Murakami

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Published by A&P Electronic Media, Spokane, Washington

First Edition
Electronic E-Book Release March, 2009

Introduction

Welcome to ***Save on Home Energy***.

You are about to walk into a world where "solutions" are commonplace and the cost of implementing them is well within your reach. Every single product and recommendation in this book WORKS. Each one has been thoroughly tested. There are no exaggerations or misrepresentations to lead you to believe some unattainable result. You CAN save 50% on your home energy costs. The methods are in your hands right now.

These solutions are not the ones that are famous. None of them are the "media darlings" that would have had the opportunity to be brought to your attention. The reason is simple. Many of these solutions are CHEAP, and they utilize inexpensive materials. That means the companies that sell them don't have OVER STUFFED advertising budgets to get the word out. Others have been available in the Commercial and Industrial markets for years, but have not found their way into the "Residential Retail" market yet. Nonetheless, some of these products have been around for DECADES.

Still others are based on new technologies that are just now becoming available, but have been years in development.

This book does not explore EVERY way to save money and energy in the home. It focuses specifically on the MAJOR methods to save the biggest blocks of energy.

Most other books and websites accurately discuss what the problems are, but none of them discuss what the inexpensive solutions are. Many "experts" out there will say that these methods don't work, or that they are not cost effective, or that you shouldn't bother, or BLAH, BLAH, BLAH. They either don't know because they have never done it, or they are PAID to do anything they can to divert your attention away from what works.

Amory Lovins, at the Rocky Mountain Institute, has been promoting some of these ideas for decades. The RMI offices are a series of buildings, tucked into the Rocky Mountains in Colorado. The total utility bills for heating and lighting these buildings has averaged under $100 per year for over 20 years.

Now these ideas can work for you. All you have to do is decide to make the change. That is the most important decision you can make. We even show you how to pay for your own modifications without touching your primary income!

So the time is now, the solutions are here, and the excuses are evaporating. All that is left is for you to DO IT.

Welcome to ***Save on Home Energy* – the #1 Home Energy Savings Manual!**

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Disclaimer

The ***Save on Home Energy*** manual is a guide for homeowners who wish to increase the energy efficiency of their home. It consists of numerous suggestions for homeowner's to "do-it-yourself".

Statements suggesting any specific energy savings or money savings are based on the benefits obtained by using certain products according to the manufacturer's recommendations. Due to the fact that different homes have different energy efficiency conditions, and different homeowner's have different skills regarding home improvement projects, YOUR RESULTS MAY BE DIFFERENT than those of others.

A&P Electronic Media, and the authors of this manual, cannot be held liable for the specific level of energy savings you may receive, and no specific claims of energy savings are guaranteed. Also, A&P Electronic Media, and the authors, cannot be held liable for any damage that may occur during your attempt to implement these recommendations in your home.

While others have implemented all of these recommendations in a safe and effective manner, you bear 100% of the responsibility for implementing them in a safe and effective manner in your home.

As you move forward to implement these energy saving recommendations, there are a number of considerations you should be aware of:

1. Modifications to your home may effect your home-owners insurance
2. Modifications to your appliances may effect the manufacturer's warranty
3. There may or may not be tax benefits for your improvements. Please seek the help of a tax professional to help you determine if you are eligible.

To maximize your success, it is up to you to use common sense when needed and seek professional help when required.

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Section One - Orientation

or

The Ancient Art of Screwing Your Head on Straight

The Bathtub Test

During a recent visit to a mental asylum, a physicist asked the Admissions Director how he determined whether or not a patient should be institutionalized.

"Well" said the Director, "we fill a bathtub with water. Then we offer the prospective patient a teaspoon, a teacup, or a bucket and ask him or her to empty the bathtub."

"Oh, I understand" said the physicist, "a normal person would use the bucket because it's bigger than the spoon or the teacup."

"No" said the Director, "a normal person would open the drain. Do you want a bed near the window?"

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Chapter One - New Sources of Energy Compared to Conservation

When most people think about "alternative energy solutions" they think about environmentally friendly sources of NEW energy, like solar, wind, geothermal, mini-hydro, or bio-fuels. So, the conversation about "lowering your utility bills" focuses on installing solar panels or a wind generator. Recently, a number of companies have started selling E-books that tell you how to make your own solar panels for a fraction of the cost of buying them new. They also tell you how to make and install a wind generator.

While these plans may have merit, what really counts is the bottom line and the amount of TIME it will take you to do all of these things. I'm not saying these ideas can't work or be implemented, but I am saying that it is not a practical answer for most of us.

The average home in the United States of America today uses 19 kWh (19 kilo-watt-hours) of electricity each DAY. To cut your energy bills in half, you have to find a way to either generate 9.5 kWh of electricity a day from some free, alternate source, or eliminate that much usage. So, let's look at this situation and find out what is the most cost effective way to cut your energy bills by 50%.

First, let's look at generating that much power using Solar. To generate 9.5 kWh of electricity a day with solar panels, you would need:

1. sun available every day of the year
2. an average of 8 hours of usable sunlight a day
3. 1500 watts worth of solar panels
4. an electronic power inverter to convert the electricity from DC into AC
5. mounting frames, wiring, etc.

The cost for such a system is dropping, but it still costs about $12,000 or more, and that doesn't include installation, permits, adjustments to your Home Owner's insurance, and other ancillary costs. So, to actually purchase and install a system to "make half of the energy you use" costs about $15,000 for the average home. You can see why so few people are flocking to make the "big move". And this is a "net metering" arrangement where you supply your excess power to the utility and buy energy back when you need it at night. If you add a big battery bank to the system, so you actually use the same power you make, the costs can go up by another 25%.

OK, now let's look at the energy savings available from conservation. I know, conservation is unpopular, because it has become associated with silly ideas, like turning your thermostat down and freezing in your own home, or going without things you really want. But the fact is that the biggest energy savings available to you, right now, are from conservation. But I don't mean the FAKE kind of conservation that the media has been

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peddling. When I say conservation, I mean real energy savings through the efficient use of energy.

Now here is the dirty, little SECRET that you probably don't know. The average home in the United States of America today WASTES over half of the energy that is purchased for it! That's right. Over 60% of the energy you buy, month after month, is never enjoyed by you for its intended use. Its like every bucket you own, has a hole in it.

Here's an example you may be familiar with. The gasoline engine in your car operates at about 20% efficiency. It's pitiful, but true. Of all of the energy available in the gasoline you buy, only about 20% of that energy is used to move your car down the road. The rest of the energy is lost in friction, or just thrown away as HEAT coming out of the radiator or the exhaust pipe. Here is another example. Currently, there is a big push to get everyone to switch from using the old, standard Incandescent Light Bulbs to replace them with the new Compact Fluorescent Lights (CFLs). Do you know why? Well, the answer is that the incandescent light is really a small HEATING ELEMENT that also happens to produce a little bit of light. Used as a heating element, it is over 90% efficient, but used as a light source it is about 10% efficient. CFLs can produce the same amount of light and use a lot less electricity to do it. Savings of up to **75%** are often cited. So, you can see, huge savings are sometimes possible *by switching to a more efficient technology*.

For over 90 years, everyone was happy to use incandescent light bulbs and settle for the 10% efficiency because there wasn't anything better out there. But now, CFLs are becoming available, so the old types of light bulbs don't look so good anymore. Switching to the new lighting technology can save you 75% on the energy you spend to light your home. Well, what if I told you that there are two or three MORE of these situations in your home that can also be corrected? Well, there are!

The good news is that, over all, the energy efficiency of your house isn't quite as bad as your car. Your house is operating at about 35% efficiency, when it comes to getting the benefit of the energy you buy. So there are huge efficiency gains available as well as INEXPENSIVE SOLUTIONS available to lower your energy bills. By using simple, common sense methods, and eliminating many of the hidden ways your home currently wastes energy, it is possible for you to cut your energy bills in half. This may seem difficult to believe, but it's true. The costs of implementing a "real fix" to minimize your energy usage might be as high as $2,000, but for many people, the costs will be much lower than this. Also, many of these expenses can be recouped with tax credits, and other subsidies. It is possible to significantly lower your utility bills with expenditures of as little as a few hundred dollars, using the information in this E-book.

So, it is completely possible to cut your energy bills dramatically for a few hundred dollars, using real conservation methods.

Now don't get me wrong. I think solar and wind technology are the wave of the future. But I also believe that this future will arrive SOONER if we all get serious about using

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energy more efficiently. The reason I am so confident that I can save you 50% on your current energy bills, is that I know you are currently purchasing and throwing away at least that much! All I have to do is show you how you are doing it, and then show you how to stop.

So, keep reading, because that is what ***Save on Home Energy*** is all about.

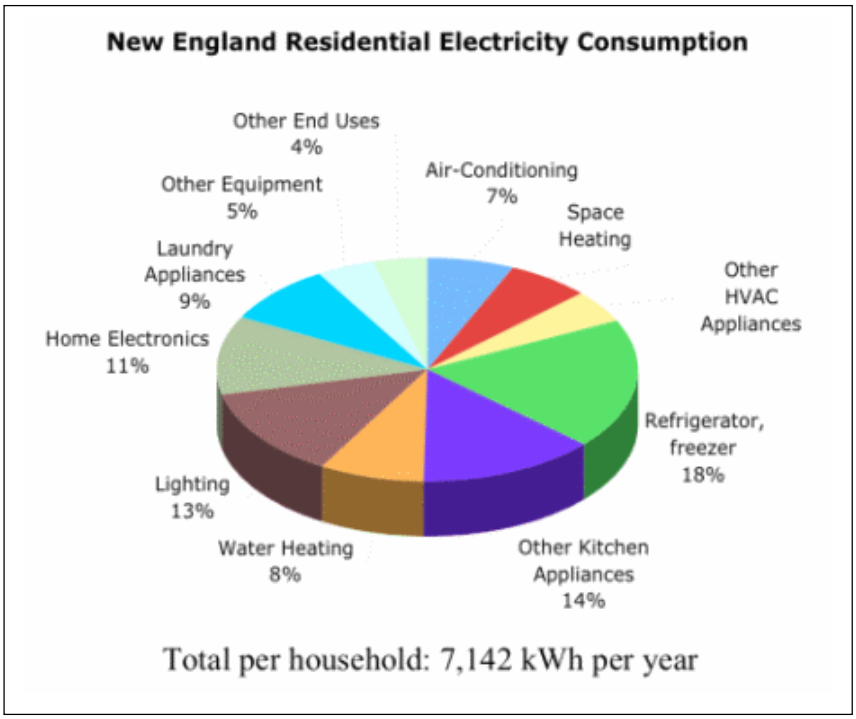
Chapter Two - The Big Picture

Before we get down to the nitty-gritty of specific solutions for saving energy and money, let's step back, and look at the Big Picture. Making the right choices quite often requires getting the right perspective on the situation. I already suggested to you, in Chapter One, that cutting out waste costs less than adding new sources of energy to your home. Now, let's look at what that really means.

You've probably heard all of the GOOFY advice from the Utility Companies. They say "every little bit helps" and then tell you to vacuum dust from the back of your refrigerator, turn down your thermostat in the winter and buy a little insulation jacket for your Water Heater. But let's face it. The Utility Companies are in the business of SELLING you as much power as they can. They don't really want you to know all of the ways you could save energy. That would be bad for their stockholders and their profit margins. So don't blame them for not telling you, but also, stop expecting them to!

Personally, I think freezing in your own home makes life too hard, so I'm going to show you how to save money on winter heating bills while keeping the thermostat set WHERE YOU WANT IT!!! Done right, you should be able to enjoy your current "life-style" and save money and energy at the same time.

Here's a Pie Chart of energy use for a typical home in New England.



You don't live in New England? No problem. I'm only using this chart as an example. We'll get to exactly how your home uses energy in the next chapter. By the way, if you

take the figure at the bottom of the chart (7,142 kWh per year) and divide that by 365 (days in a year) you get the average energy use per day, which is 19.5 kWh per day.

OK, in this example, you can see that there are about seven or eight major categories of energy use, like Home Electronics, Lighting, Water Heating, and Kitchen Appliances. You can see that I could save 50% on my energy bills if I just stopped using half of this stuff. But taking cold showers and stumbling around in the dark is NOT the solution that lets me enjoy the life-style I want. So, what do we do?

First, we are going to look at each category of energy use separately, because each one has its own, unique efficiency problems. Second, I'm going to show you how to save the MOST from the BIGGEST ENERGY categories first, so you get the biggest bang for your buck! Third, I'm going to show you how to save energy in every single category, so you can pick the ones that are easy, cheap, and right for your situation.

Your Motivation:

Before we begin, YOU have to determine WHY you want to do this. What is your motivation to ***Save on Home Energy***? Some people just want to save money, and that is their only consideration. Just paying the least money every month is as far as they look. This is almost never the cheapest or best solution, but it is what many people do. So, let's look at THREE possible motivations for doing this. There may be other good reasons, as well.

1) Save Money - this motivation is about spending money to change your energy uses ONLY IF there is a short-term "return on investment" or ROI. In other words, if you spend $100 today to lower your energy bills, how soon does your SAVINGS pay you back the $100? So, for instance, if the energy saving expense saves enough MONEY on your energy bills to pay for itself in 6 months, then it's a great idea. But if it takes 10 years to pay for itself in savings, then you probably won't do it, because it doesn't make financial sense to spend the money that way. After all, its a lot cheaper to "waste a little bit more energy today" than fix the problem.

So, with this motivation, the question of "can I afford this?" is about the ability to invest "cash on hand" to lower "your monthly bills" for energy, and do it in a way that pays you back, fast. It's about the money.

2) Save Energy - this motivation is focused on reducing energy use with the idea that tomorrow's energy may cost much more than today's, or that tomorrow's energy may be more difficult to get than today's. So, whatever the ROI, I am going to be better off in the future if I use less. It's about having more "energy security" and knowing my energy costs are not going to go up even if the cost of energy goes up.

So, with this motivation, the question of "can I afford this" is actually more about "can I afford NOT to" make these changes in my energy use pattern today? It's about security.

3) Save the Environment - this motivation is about "lowering your carbon footprint" and realizing that the way you use energy and the way the creation of that energy pollutes the planet is within your ability to change. This is about being a responsible member of a planetary society and being a good steward of the environment.

So, with this motivation, the question of "can I afford this" is about "how much am I willing to spend" to reduce my impact on Climate Change, leave the planet cleaner for my children, and live within my "appropriate" energy means for today and tomorrow. It's about social responsibility.

By the way, if you are interested in saving the environment, here is an interesting fact. The total efficiency of the electric power grid itself is only about 50%. That's right, your electric Utility has to generate TWO units of electricity just to sell you ONE, because HALF of the energy is lost in transmission! What this means is, if you reduce your electricity use by 50%, you have actually reduced the load at the Utility's generators by the equivalent of your ENTIRE ELECTRIC BILL. When you compound all of the losses in the system, it means that **conservation helps Save the Environment faster than any other method!**

I believe all three of these motivations are important and should be embraced whenever possible. I also believe that the best methods to ***Save on Home Energy*** will do all three; save money, save energy and help save the environment! But what I think isn't nearly as important as what YOU think. You are the one who is going to decide if any of these ideas to ***Save on Home Energy*** are right for you. So, if your primary motivation is to save money, that's a great place to start.

As you can see, your motivation may change how much money you "have available" for the project. Along this line of thinking, here is one more thought. I have seen numerous people who thought they were flat broke, with no money left for anything. Then, the transmission goes out in the car they use to drive to work. In this situation, it is remarkable how quickly these people can find $3,000 to fix the car! The point is, we all have resources we usually don't draw upon until "something" focuses our attention. If you CHOOSE to cut your utility bills by 50%, then figuring out how to pay for it is just another detail and we even provide a solution for that!

Your Time Frame for "Cost Effectiveness"

Your motivation for implementing any of the ideas to ***Save on Home Energy*** will also determine how much you are willing to spend on the project, as well as the "cost effectiveness" of that expenditure.

For instance, if my motivation is to save money, then the time frame for cost effectiveness has to be relatively short, otherwise there may be a better way to invest the money. Making the energy saving expenditures has to "pay me the money back" quickly

because, primarily, it’s a short term investment, and its treated like money in a savings account that has to earn interest.

But, if my motivation is to save energy, then I'm better off making the changes as soon as possible, and I may even have a budget for the expenditures. I know that the energy related home improvements will make my home more valuable, but I am not looking to "cash out" on that increase in value in the short term. So, making the changes is "cost effective" as soon as I have the funds available to invest in a long-term investment. If you think of it as an "energy retirement account", you might want to make deposits at regular intervals!

Finally, if my motivation is to save the environment, then the cost effectiveness is related to "how soon" can I afford to switch to "a cleaner, more responsible life-style".

Living Situation

The last consideration in being able to implement any of these ideas to ***Save on Home Energy*** relates to your living situation. If you own your own single-family home, then you are free to implement any of these ideas whenever you want. But if you rent a house, or live in an apartment building, or even own your own Condominium in a larger building, you may be restricted as to how you can implement some of these ideas.

The purpose for this manual is give you, regardless of your living situation, a wide variety of choices to lower your energy bills and ***Save on Home Energy***.

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Section Two - Evaluation

or

The Ancient Art of Asking the Right Question so You Can Get the Right Answer

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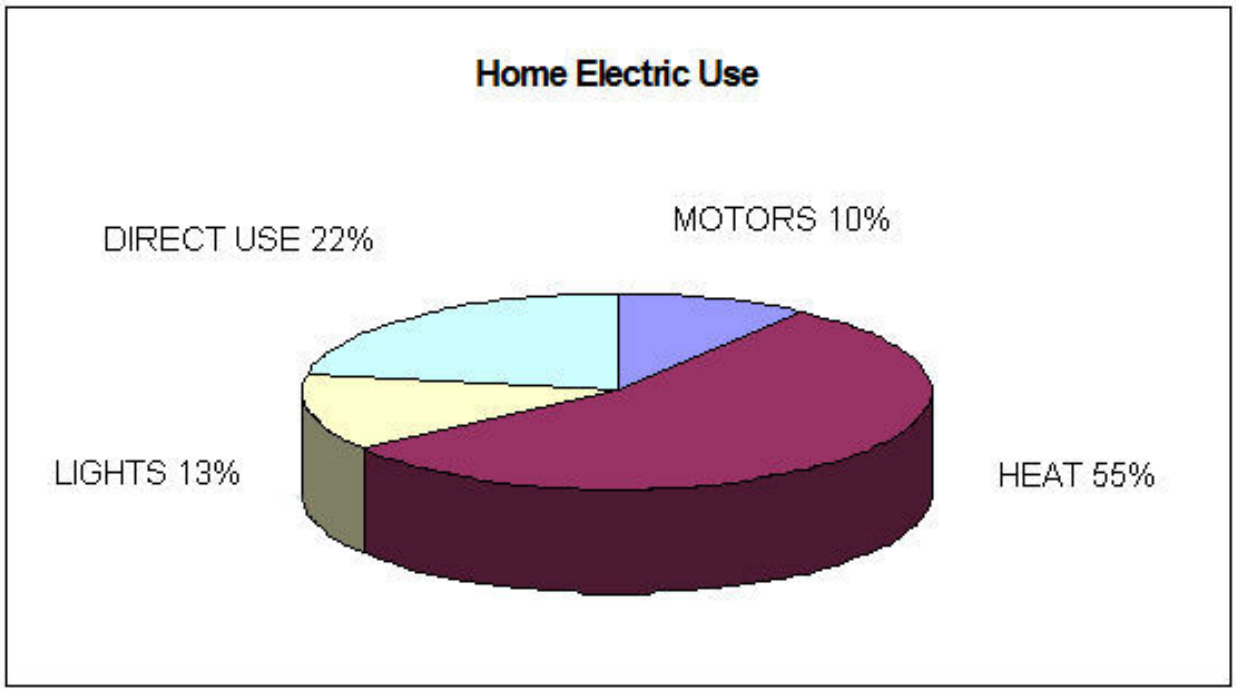
Chapter Three - How Does My Home Use Energy?

Energy Use Basics

Before you can figure out how to ***Save on Home Energy***, you first have to understand how your home uses energy. After you understand how the energy is used, it will be easier to see how well it is used, and also see where it is wasted.

OK. Let's start by looking at Electricity. Your home may also use Natural Gas or other forms of energy, but we will get to those specifics in later chapters.



Electricity is used in your home to produce just FOUR different end products. These different end products are:

1. HEAT
2. LIGHT
3. MECHANICAL ENERGY
4. DIRECT use for ELECTRICAL PURPOSES

Examples of these are as follows:

1. HEAT is made in appliances like your toaster, and your water heater.
2. LIGHT is made in various types of light bulbs and lighting fixtures.
3. MECHANICAL ENERGY is made in electric motors, used to run appliances like your blender, or a cooling fan.

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4. DIRECT ELECTRICAL USES include your computer, telephones, and TV.

So you see, electricity is used to produce just FOUR basic things. It's not complicated to understand.

All of these various appliances use electricity at different efficiencies and for different end benefits. So, HOW WELL the electricity is used can be broken down into these SIX main categories:

1. energy purchased now and used efficiently now
2. energy purchased now and used inefficiently now
3. energy purchased now and wasted now
4. energy purchased now and used efficiently later
5. energy purchased now and used inefficiently later
6. energy purchased now to be used later but lost before use

Examples of these are as follows:

1. Energy purchased now and used efficiently now is like lighting a room with a fluorescent light while you are in the room
2. Energy purchased now and used inefficiently now is like lighting a room with an incandescent light while you are in the room
3. Energy purchased now and wasted now is like lighting a room with any kind of light when you are *not* in the room
4. Energy purchased now and used efficiently later is like charging a battery over night and using it in your cell phone the next day
5. Energy purchased now and used inefficiently later is like drawing a bath of hot water and letting it cool off before you get in
6. Energy purchased now but lost before use is like heating water in your water heater but having it cool off in the tank, so it needs to be heated a second time before you use it

So you can see, electricity is used to produce FOUR basic end uses at SIX different efficiency levels. Of these FOUR main ways of using electricity, the biggest savings are available in the HEAT and LIGHT categories, with lesser savings available in the other two. Of the SIX levels of efficiency, the biggest savings are available in the pure waste categories like #3 and #6, with less savings available in categories #2 and #5, and very little improvement available in #1 and #4. Broken down like this, its pretty easy to see what is going on.

Energy Use Specifics

HEAT and the management of heat, including getting rid of it when we don't want it, represents about 55% of all energy used in the home. So HEAT is the most important

category of energy use in your home. The following list represents most of the major appliances in your home that produce or remove heat as their primary function:

space heating (furnace, room heaters, portable heaters)
hot water
air conditioning (all heat pump systems)
refrigerator and freezer
cooking appliances (stove, oven, grillers, toasters, waffle iron, etc)
clothes dryer
dry cycle for dishwasher
coffee maker
hair dryer (curling iron, etc.)
clothes iron
popcorn popper

LIGHT and lighting appliances represent about 13% of all energy used in the home. Because of the availability of new lighting technologies, this category also represents a possibility for significant energy savings. The following list covers most of the major lighting uses:

overhead room lights and recessed spotlights
room lamps
desk lamps and other surface lighting
specialty lights (closets, night lights, etc.)
outdoor lighting (front porch, garage, yard, walkways, etc.)

MECHANICAL ENERGY produced by electricity almost always uses electric motor technology. This energy use category is responsible for about 10% of all electrical energy used in the home. The following list of appliances use electric motors to produce their primary function:

clothes washer (for agitation and spin cycles)
dish washer (for wash cycle)
blender
mixer
food processor
fans
trash compacter
in-sink disposal
water pump (if you own your own well)
vacuum for carpets

DIRECT ELECTRICAL USE for electricity in the home is the fastest growing category of energy use. Depending on how "modern" your lifestyle is, this energy use

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may be approaching 22% of all the electricity used in your home. The following list of appliances use electricity directly to produce their primary function:

computers, printers, screen, scanners, surge protector
TV
VCR/DVD recorder
Music system
fax machines
cordless phones
cell phones
digital camera
battery chargers
clocks

These lists represent the major appliances in your home that use electricity. Many of these devices COULD be made to use less energy, but it is not "cost effective" for you to try to improve them. You may also have some appliances in your house that are not listed here. That's no problem.

Also, you may have noticed that some of these appliances could actually be listed in two of these categories. An example of this is a portable Hair Drier because it has both an electric motor to BLOW the air and a heating element to HEAT the air. I listed it in the HEAT category because it uses more energy for this function. The main idea here for you to understand is that there are just FOUR basic categories for the use of electricity and that everything in your home falls into one of these major groups.

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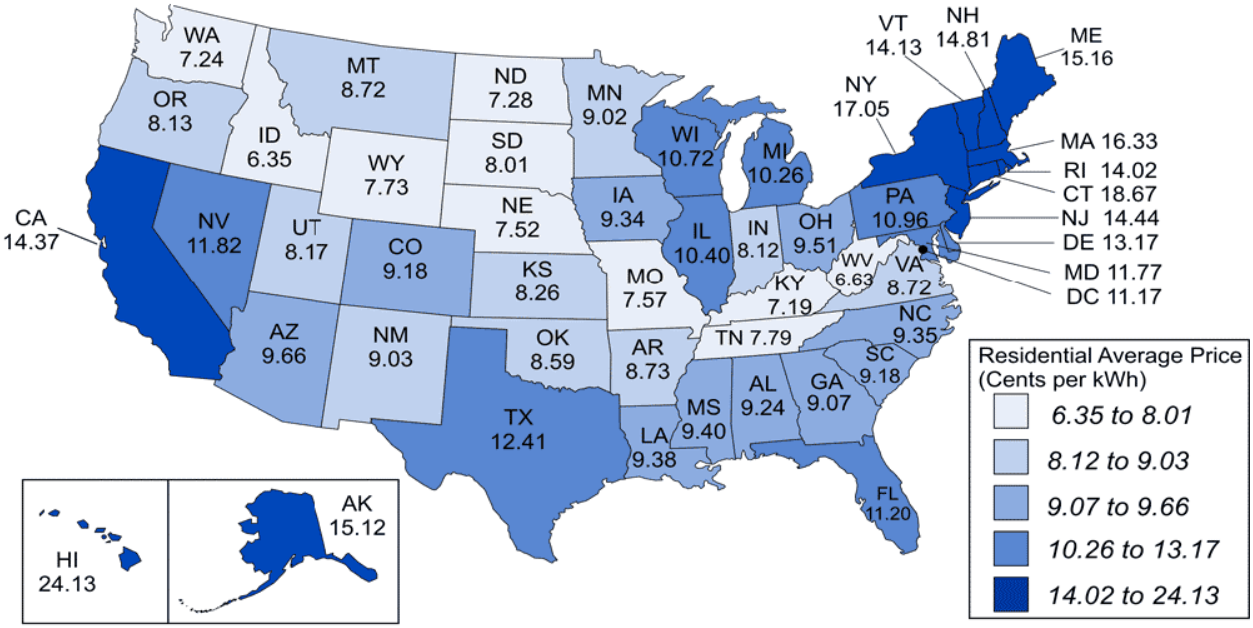
The U.S. average residential retail price of electricity was 10.64 cents per kilowatthour in 2007.



Source: Energy Information Administration, Form EIA-826, "Monthly Electric Sales and Revenue with State Distributions Report."

Here is a map of the USA showing the average cost of electricity, State by State, in Cents/kWh. Of course, your individual rate may be higher or lower than these figures. Figures available at the Energy Information Administration show that average monthly electric bills range from $80/mo. to over $140/mo.

You can also see that in the States where electricity is cheaper, it is used more for space heating and hot water, and where it is more expensive, other energy sources like natural gas or fuel oil are used more commonly for these DIRECT HEAT production needs.

For more information, go here: http://www.eia.doe.gov/fuelelectric.html

OK, this lays the groundwork for understanding the situation. Now let's take a closer look at the most important category to ***Save on Home Energy***, HEAT.

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Chapter Four - Special Considerations Regarding Heat

As we saw earlier, HEAT producing appliances represent more than half of the energy used in your home. And, like other forms of energy, heat appliances fall into all SIX of the efficiency categories. So, for instance, a Foreman two-sided griller is an incredibly efficient way to cook a steak. It's definitely in the #1 category. You plug it in, it warms up in two minutes, it takes another three minutes to cook the steak and you are done. Any other way to cook the steak, like your oven broiler or a pan on your stove, will take both more time and more energy. So, the use of heat can be incredibly efficient.

But HEAT is also the largest energy category where you pay for the energy NOW to use it LATER. The only other significant example of this is charging a battery now to use in some small appliance later, like your cell phone, laptop computer, MP3 player, portable tool, or camera. But the amounts of energy used in these battery charging situations is relatively small, whereas the amounts of energy used to heat your home or your hot water are over 100 times greater. So, for efficient use of HEAT in these situations, the ability to STORE heat after you have made it is a critically important issue with regard to your energy bills.

This ONE ISSUE, the ability of your home to STORE HEAT more efficiently, represents the single largest opportunity to ***Save on Home Energy*** that you have.

Heat Retention Methods

Unless you have studied physics, or are an HVAC professional, you probably don't know much about how heat behaves, or how to hold onto it once you have made it. Most people know to use a "hot pad" to pull something out of the oven, or that their coffee stays warm longer in one of those insulated mugs, but not much more. So, here is your quick "college education" in the science of heat retention.

First, HEAT is a known form of energy, recognized by Science. Its formal study is called Thermodynamics. COLD is simply the absence of HEAT. So cold isn't anything, really, except the recognition that there is less HEAT in one area than in another. When we start talking about specific appliances, this will make more sense. Just remember for now that even if we are talking about COLD, we are still just talking about HEAT management.

Second, HEAT wants to move from an area of higher temperature to an area of lower temperature, and will do this all by itself with no help from you. So, anytime we want to create an area that is warmer or colder than the surroundings areas, the natural behavior of heat will be to try to make everything the SAME TEMPERATURE again as quickly as possible.

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Third, HEAT is sneaky! It can move around using THREE different methods. So, to effectively TRAP heat in something or KEEP heat out, we have to make sure we are blocking all THREE ways that heat can move. These three ways heat can move are called:

1. Convection
2. Conduction
3. Radiation.

Convection is the first way HEAT can move. It does this by transferring to the AIR and then moving around as the AIR moves. So, trying to heat a room in the winter with the window open doesn't work very well because all of the heat escapes right out the window. So, we can stop **heat loss by convection** if we just close the window and *stop the flow of air*.

Conduction is the second way HEAT can move. It does this by transferring to any other material that it is in contact with. So, trying to heat a trailer in the winter with really thin walls doesn't work very well because all of the heat escapes right THROUGH the walls. It does this because if the wall cools off to the outside temperature the heat conducts directly to the outside AS IF the wall wasn't there. So, we can stop **heat loss by conduction** if we *put a material in the walls that does not change temperature very quickly*.

Radiation is the third way HEAT can move. It is definitely the sneakiest form of HEAT because it can move through things without even heating them up! In technical terms, this form of heat is called INFRARED radiation. It is like visible LIGHT, except it has a longer wavelength. But like visible light, the best way to block or reflect it is with a MIRROR. These "heat mirrors" are usually called a "radiant barrier", but quite often look like a thin piece of aluminum foil. So, we can stop **heat loss by radiation** if we *put up a radiant barrier facing the direction we want the heat to be reflected back to*.

Understanding Insulation

Now that we know the three ways HEAT can move or escape, we now know what insulation is supposed to do. Good quality "effective" insulation will BLOCK heat radiation with a radiant barrier, and PREVENT heat loss by both conduction and convection. The best example of a device that does this extremely well is known as a THERMOS. It consists of a mirrored glass container surrounded by a vacuum.

The mirrored glass acts as the radiant barrier to constantly reflect the Radiant HEAT back into the container. The vacuum area surrounding the mirror is actually a zone with *nothing* in it, which prevents heat loss by conduction, since there is nothing in the vacuum that the heat can transfer to. The insulated cap stops any airflow around the hot liquid so it prevents heat loss by convection.

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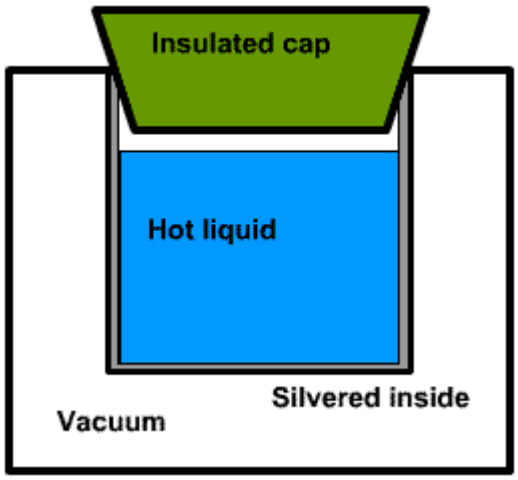

Using these principles, a Thermos can keep a liquid hot for a very long time, because the heat just can't get out by any of the available methods. In this way, the same heat you put in the thermos with the hot liquid will keep it hot indefinitely, until it escapes. A container with a "perfect insulator" around it could keep something warm forever, for free! Things only "cool off" because the HEAT that is warming them has escaped using convection, conduction or radiation.

For more information on how a Thermos works, go here:
http://www.school-for-champions.com/science/thermos.htm

R-value and Insulation

All insulation materials sold in the USA are rated with an "R-value" rating. The R-value number is a standardized way of rating HOW WELL a material *resists* the flow of heat and is an indication of its ability to insulate. The higher the R-value, the better the insulation. The actual mathematical formula for calculating the R-value of a material is quite simple. Basically, it relates to the surface area to be insulated, the temperature difference to be maintained, and the length of TIME you want to maintain that temperature difference.

So, the higher the temperature difference OR the longer the TIME you wish to maintain that temperature difference, the higher the R-value rating must be.

While this R-value rating system is HELPFUL in determining a material's insulation abilities, depending on a number of factors, the REAL ABILITY of a material to provide effective insulation may be ***higher or lower*** than the number indicates. If the insulation material itself can be warmed up or cooled off by **Conduction**, the material may **lose it's ability** to insulate all together, regardless of its R-value rating. So, this is an important situation to keep in mind and prevent whenever possible. Only insulation materials that resist changing temperature can provide effective insulation benefits against the transfer of heat!

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For more information on how insulation works, go here:
http://www.school-for-champions.com/science/thermal_insulation.htm

Your Secret to Effective Insulation

OK, here is the dirty little secret about insulation that nobody will tell you. If you want to store heat effectively, you need a MINIMUM of R=1 insulation value for every Degree Fahrenheit of temperature difference you wish to maintain [R=1/ºF]. So, if you want to maintain a constant 30ºF difference, you need an effective insulation jacket rated at R=30. Anybody who tells you different either doesn't know any better or is only trying to make money off of you! As a perfect example, the reason a commercially available Thermos can keep your coffee hot all day is that it has an insulation capability of R=250. This is well known in industry, but hasn't made it to the TV home improvement shows yet.

So, this is the **R-FACTOR RULE** that I want YOU to remember: when installing insulation, the R-value rating needs to be equal to or greater than the highest temperature difference you want to maintain, measured in Degrees Fahrenheit. An example of this is for your refrigerator. The temperature of your kitchen is about 70ºF and the inside of your refrigerator is supposed to be about 40ºF, so the temperature DIFFERENCE is 30ºF. That means, to be cost effective at keeping your food cold for the lowest amount of electricity to run your refrigerator, the insulation in the walls should be at least R=30. Anything less will waste energy by letting heat back in through the walls too quickly, so the refrigerator will have to turn on again to pump it out.

Rule of Thumb for Insulation

For insulation to be effective at keeping heat INSIDE something, (like your Water Heater) it must first have a radiant barrier facing the HOT SIDE, surrounded by a layer of material that both seals the surface to prevent convection, and also does not change temperature very quickly, to stop conduction. Add to this, extra layers of material if you wish to maintain high temperature differences over long periods of TIME.

For insulation to be effective at keeping heat OUTSIDE of something, (like your refrigerator) it must first seal the surface and stop conduction and then have a radiant barrier facing the HOT SIDE, which in this case is outward.

For insulation to be effective at keeping both heat in and out, (like the outside walls of your home) it must have a radiant barrier on both sides and be filled with a material that both seals air leaks and does not change temperature too easily.

OK. It’s time to find out how YOUR HOUSE uses energy.

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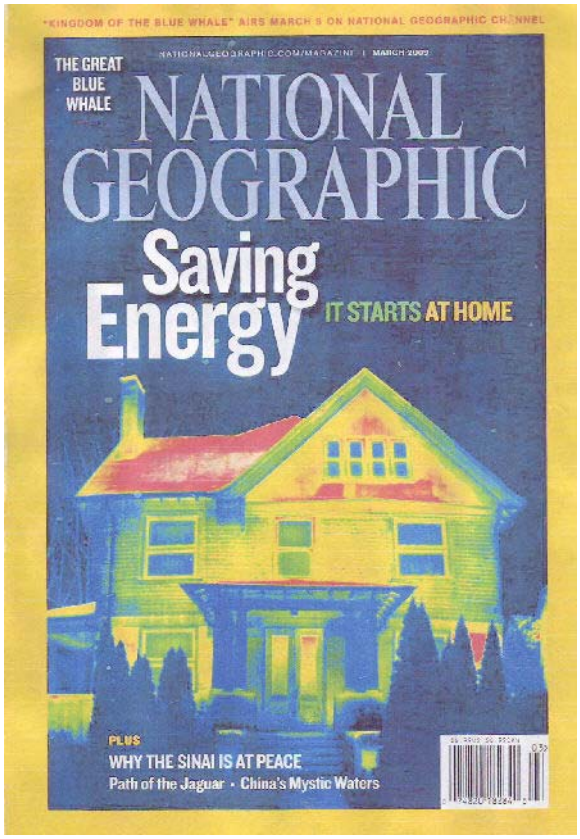
Chapter Five - Doing a Meaningful, Home Energy Audit Yourself

The purpose of doing a Home Energy Audit is to allow you to understand how well your home is using energy right now. This will help you identify the significant problem areas so you can focus your home improvement efforts on those issues that will cost the least and save you the most energy and money. The following link takes you to the US Department of Energy website for some simple pointers on doing your own Home Energy Audit.

http://apps1.eere.energy.gov/consumer/your_home/energy_audits/index.cfm/mytopic=11170

Depending on how large your home is and your budget, you may also want to consider getting a professional Home Energy Audit, just to get a true baseline on where your home is currently wasting energy.

The main purpose of this manual is NOT to replace a professional service. A complete Home Energy Audit would find dozens of things that could be fixed to save you money. Most professional residential energy audits involve thermal imaging of the home to show all of the heat leaks. Since we already know this is the main issue, the expense of the professional service can be skipped.



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Here is a reproduction of the cover of the March, 2009 issue of National Geographic Magazine. This picture is a thermal image of a typical home, like yours. The colors represent different temperatures, from the hottest = RED to the coldest = BLUE. In this image, you can "see" all of the heat coming right through the walls (yellow) and especially through the roof (red). This is the WASTE I am talking about. This is the money you are currently throwing away, and could be saving every month. If the entire house looked BLUE, like the porch, it wouldn't be losing any heat. THAT is what you want your house to look like!

The main purpose of ***Save on Home Energy*** is to help you find the SEVEN BIGGEST ways your home is currently throwing away the money you spend on energy. If we just find and fix those seven things, your energy bills can and will be cut dramatically.

I've already told you that the biggest "pure waste" categories are in the HEAT Storage areas. So, that is what we will focus on first. To do this, it can be useful to own an Infrared Thermometer, or one of the new Thermal Leak Detectors.

Also, if you want to actually measure how much electricity any of your appliances is actually using, owning one of the new Electric Power Meters can be quite useful. Besides these simple tools, all you need is a little common sense.

So here is a short list of the energy improvements we are going to focus on.

1. Finding and fixing all of the air leaks
2. Up-grading insulation in the walls and attic
3. Up-grading insulation on certain home appliances
4. Up-grading your lighting technology
5. Up-grading your furnace and AC units
6. Turning OFF unused stuff
7. Cooking with appropriate appliances

All of these things are doable, and all of them will save you money and energy, although the biggest savings will be in the first five categories in this list. If we focus on these things, a comprehensive Home Energy Audit isn't really necessary.

Auditing your Energy BILLS

The last thing I can recommend here is that it is always a good idea to look carefully at your BILLING STATEMENTS. After all, you are the one paying the bills. Make sure the fees and charges you are paying are correct. Question "unknown" charges or other "add-ons" that don't make sense to you. Many billing services "sign you up" for all kinds of extra fees that are optional and you may not really want or need. Don't be "contributing" to paying other people's energy bills if you don't want to!

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Utility Bill Auditing is a little known service offered by various companies. 70-80% of utility bills contain errors and this is another little known secret. Here is an example of one of many Utility Bill Auditing companies: Utility Check, LTD. You can also do an Internet Search for other companies to learn more about this incredible service. Utility Bill Auditing.

Level Pay Plan

Also, if you are like most people, your energy bills can change quite a bit, season to season. In a major "cold snap" or "heat wave" your power bill can go through the roof! This can make "budgeting" for your bills difficult. Most Utility's offer a "level-pay-plan" that averages your energy costs on a yearly basis, so there are no really high or low months. See if this option might be right for you. It can help make living within your budget a little easier.

Section Three - Implementation

or

The Ancient Art of Choosing the *Right* Solution

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http://www.save-on-home-energy.com

Chapter Six - Heating and Cooling

Most people believe that the "heating and cooling system" of their home consists of the furnace and the air conditioner units. But really, these appliances are only where the energy is USED to produce the heat or cold. The REST OF THE HOUSE is where this energy is either retained or allowed to escape! The biggest energy savings are going to be made by modifying the insulation characteristics of the house. Some gains can be made by improvements to the furnace and AC units, but in general, they are much smaller and should be looked at *second*.

The Budget

Heating and cooling costs vary quite a bit, region to region, so you have to figure out how much money you are spending on this each year. When both heating and cooling are figured together, most households spend between $1,200 and $3,000 a year. If the plan is to cut these costs in half by increasing the efficiency of your home's insulation, then one half of your Annual Cost for heating and cooling is your potential budget for adding more insulation, if you want an ROI within the first year.

For instance, if your annual costs for heating and cooling are $1,500 a year, and you can cut them in half by DOUBLING the EFFECTIVENESS of your insulation, then next year your costs should only be $750. So, if you need to spend up to $750 for this insulation up-grade, then your "return on investment" ROI is just ONE YEAR. If it costs less, then your ROI is sooner.

So, knowing how much you are spending on heating and cooling right now will determine your budget for improvements, and your ROI for the investment.

Here's a simple On-Line calculator for figuring Winter heating costs:
http://www.travisproducts.com/CostOfHeating_WkSht.asp

Figuring out your Summer cooling costs is similar.

Getting Started

OK, I know you are thinking, "he wants me to tear the walls down and ruin my house". Actually, I don't. When I say "modifying the insulation characteristics of the house" I mean making changes to how your insulation works, so it can work as well as possible. The other thing I know is that there are some insulation products on the market now that you can just "paint on" so doubling or even tripling the effectiveness of your insulation is now possible WITHOUT tearing down the walls! These products have been used successfully in the commercial and industrial sectors for years, and its time you got the benefit too. So, let's get to work!

Sealing the Air Flow Leaks

The DOE estimates that heating and cooling costs can represent up to 50% of a home's energy costs. In the northern tier of states, this is often true. It may also be true in the hotter southern states, due to air conditioning costs. If you live in one of the more moderate climate zones, it may be a little bit less than this. HVAC contractors estimate that "air leakage" accounts for about 30% of all heating and cooling expenses. If the math is right, simply by sealing the air leaks in your home you can save a huge 15% on your energy bills! This represents the **heat loss by convection** that we discussed earlier. If our goal is to lower your energy bills by 50%, then this is the biggest single area of savings available!

Its been estimated that the average house behaves as if it is perfectly sealed against heat loss, but has a "one square foot hole" in one wall! Of course, that "one square foot hole" is actually in the form of dozens of much smaller holes spread throughout your house. So, your job is to find all of the holes that make up the "one square foot hole", and stop all of the uncontrolled airflow in and out of your house.

So, where are all of these leaks? Well, some of them are obvious, like worn weather seals around your doors, or thresholds that allow air under the door. The next obvious place is to look at every window in the house and make sure that air does not leak in when they are shut. Just sealing these two things can make a huge difference. Every window in the house has to be inspected carefully for air leaks:

1. between the window and the frame
2. between the part of the window that moves and the part that does not move
3. between the window frame and the wall
4. between the individual panes of glass and the frame

If you determine that your windows are a major problem, this will have to be corrected. Whole manuals have been written just on the proper methods to evaluate and fix leaky windows. While fixing airflow leaks in windows can be very fast and cost effective, replacing unfixable windows can be relatively expensive. Only you can determine whether your windows have significant air leaks, and whether they can be repaired or need to be replaced.

But there are lots of other, smaller holes that also need to be sealed before you are done. The following is a list of the "usual suspects" and the most probable places to find air moving in and out of your home.

1. Interface between a brick chimney and the walls and ceiling. This can be a huge, hidden source of air leaking into the house. Closely inspect the entire seam and fill any openings using a Spray-in Expandable Foam. After it dries, just cut off the extra and paint if necessary, to re-establish the esthetic look you desire.

2. The chimney flue is open when the fireplace is not in use. If the flue is open, this is obviously a large opening for HEAT to get in or out of the house unnoticed. Always close the flue when the fireplace is not being used. If you can still feel a draft when the flue is closed, consider making a special insert to block all airflow. It may take a little thought to build a specially shaped insert, but if your house needs this, one hour of work can save you a lot of money every year.
3. Places where pipes go through walls. Here is another simple thing to inspect and fix. If any holes are found, simply fill the openings with Spray-in Expandable Foam. After it dries, just cut off the extra and paint if necessary.
4. Wall plugs and switch plates on outside walls. Outside walls are your main barrier to the outside temperature, and electrical switches and plug receptacles are not only holes in the walls, but places where there is less room for insulation in that area. Inspect each one by removing the cover plate and looking at how the hole in the sheet rock interfaces with the size and shape of the electrical box. Fill any openings between the *outside* of the electrical box and the sheetrock with the Spray-in Expandable Foam. After it dries, cut off the extra and replace the cover plates. (Note: Do not spray foam insulation into the electrical box itself.)
5. Attic hatches. Quite often, the attic is significantly hotter or colder than the rest of the house. So, if air is leaking around an attic access hatch, it needs to be sealed. For this, a soft, foam weather stripping material is usually the answer. Also, the hatch door may need to be insulated as well, but I will talk about that in a later section.
6. Cracks or spaces under baseboards. Modern house building methods use baseboards and other door frame molding to cover up a wide variety of imperfections in framing and plaster board work. You never really know what's behind there. So, if the baseboards don't seal against the floor, it is possible for air to move through the walls. Check every seam between every wall and floor in every room. Look for spaces, but also feel for airflow or drafts. If you find any, fill the spaces with the Spray-in Expandable Foam.
7. Bathroom Exhaust Fans. Bathroom fans are wonderful when you want to keep the steam from your shower off of the mirror. Unfortunately, most of them are not sealed well when they are not running. In the winter, when it is cold outside and you are trying to heat your home, hot air can just rise right out the ducting used by your bathroom exhaust fans. This is especially true at night. To prevent this, separate the bathroom from other heated rooms by closing the door to the bathroom, so heat cannot escape so easily.
8. Anywhere else you can "feel a draft". During your inspection, if any other air leaks are discovered that are not listed here, just handle them in the best way you can.

The goal is to seal every air leak that you can find. You want to fill all of the major air leaks and at least 90% of the minor ones. This is STEP ONE.

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Windows and Doors

After all of the air leaks are fixed, the next biggest area to ***Save on Home Energy*** is further insulating the windows and doors. Even if air isn't leaking in around them, most older homes still have solid wood doors and plate glass windows, both of which have an insulation value of R-1. This means that heat will easily move right through them by **Conduction.**

Replacing your current doors with insulated doors is one option. Most new insulated doors have a foam core of R-5 insulation, surrounded by a steel frame and covered by a thin sheet of metal. This makes them stronger than wooden doors and better for security purposes. While this level of insulation is relatively low by our standards, it is still **FIVE times better** than what it is replacing! Insulated doors cost between $200 and $400 each, but can be well worth it if your budget allows.

Replacing plate glass windows with Double Glazed, insulated windows will improve your home's thermal properties enormously. But this "up-grade" is the most expensive home improvement in this whole process, and may be too expensive for your budget right now. If you can afford it, seriously consider it. If you can't afford new windows right now, I recommend the following.

There are a number of clear, insulating plastic films that can be placed on top of your existing windows to provide a radiant barrier to the passage of heat. These products are usually called "low-e" films and stand for "low-emissivity films". One company, named Energy Film, sells rolls of the plastic sheets for home owners to apply to their own windows. This product can be purchased locally, or at our online store: Energy Film

Insulation Up-Grade

So far, we have Sealed the Air Leaks and fixed the windows and doors. These fixes are pretty much the same as everybody else recommends. The next thing I'm going to tell you is different than the standard advice, but the results are much better.

Remember the **R-FACTOR RULE**? Well, this is where it starts coming into play. If you have an average home in America, (or somewhere else) your outside walls are probably insulated to about R-19. This has been the Building Code Standard for many years. The DOE is now recommending that you up-grade your outside walls to R-25 and your attic to R-40. If you follow these recommendations you will save some energy, but not much.

I didn't spend all of that time explaining the function of HEAT and insulation to you simply to ignore it. Here in Spokane, Washington, the outside temperatures can go down to -20ºF in the Winter and up to 105ºF in the Summer. If I want to maintain the inside temperature of my home at 70ºF all year around, I may have some Winter nights with a 90ºF temperature difference to insulate against. There will also be some Summer

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afternoons with a 35ºF temperature difference accompanied by a brutal onslaught of Infrared Radiation from the Sun. I can tell you for sure, an insulation package of R-25 is not going to help me maintain my 70ºF comfort zone very well in these extremes.

Even to insulate against the average Winter evening temperatures of 20ºF, I would need a minimum of R-50 in the walls, windows, doors, and attic. To handle the Summer heat, I would need the same R-50, PLUS an effective Radiant Barrier in the attic or on the roof, as well as on the outside walls facing the South and West.

So, I hope you can see what is really required to keep the heat both in and out of your house, and why the standard recommendations are totally inadequate. In the Winter, you must stop the HEAT that you have paid for from LEAKING OUT. In the Summer, you must stop the HEAT that you have paid to get rid of from LEAKING BACK IN. If you don't, you have to pay and pay again to compensate for the HEAT LEAKS.

In fact, that is all you are paying for right now!

So, the real question is how do you take your home, in its current condition, and start moving it in the direction of having the level of insulation that you really need, without an expensive, major remodeling! Is this possible? Luckily, the answer is YES.....(in most cases).

ATTIC: Your attic should contain a minimum R-40 of standard insulation. Recently, the new *international* standard for attic insulation has been raised to **R-60**. Add to this at least one layer of radiant barrier, preferably in the rafters for southern hot climates or laid directly on top of the insulation on the ceiling for northern cold climates.

In hot southern climates, the goal is to primarily keep heat from coming into the attic by reflecting the radiant heat from the roof outwards, before it has a chance to heat the air in the attic.

The following picture shows an installation of PRODEX Total Insulation, which has two layers of Radiant Barrier, one facing the roof and one facing the interior of the attic, with a sealed foam layer of R-5 in-between.

Add to this an attic exhaust fan, and you are ready to beat the Summer heat and Winter cold.

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Radiant barrier on rafters for southern hot climates

In northern cold climates, the goal is to keep the heat that you make inside the house from escaping by moving through the ceiling and into the attic.

This picture shows a layer of "perforated" radiant barrier laid on top of **R-60** insulation across the entire attic. This is a house in a northern climate where it is preferable to keep the heat in the house during the winter.

Radiant barrier on insulation for northern cold climates

Perforated radiant barrier is available for installation in humid climates. The perforations in the barrier allow moisture to escape so that it doesn't collect and cause any water damage and rot to the wooden rafters.

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This link shows current recommendations for insulation:
http://www.simplyinsulate.com/savings/index.html

Adding Insulation to the Walls

Adding more insulation in your attic is easy, because it doesn't have to be pretty. But how do you increase the insulation of a wall without tearing it out and starting over? The answer is, we use a NEW TECHNOLOGY!

While these products are not well known yet in the residential market, "paint on" insulation products have quietly revolutionized the industrial and commercial markets. All of these products are based on a "ceramic bead" technology, developed by NASA and are a direct technology "spin-off" from the Heat Shield used on the Space Shuttle! These beads are like very small glass balls with an interesting feature: they have a vacuum inside. Remember when I was talking about the THERMOS as being the ideal thermal insulator because it used a vacuum to block the heat of conduction? Well, these little micro-beads do the same thing. Added to paints, and other acrylic and elastomeric coatings, these ceramic beads can turn these products into an effective insulating layer.

The very best products in this class function as both a Radiant Barrier, blocking 95% of Infrared Radiation, as well as a Conduction Barrier, with a real R-26 insulation value, and are about as thick as a standard business card! Painted on the outside of your home, these products can block Summer Heat from entering. Painted on the inside, these products can keep the heat you have already paid for from leaking away. Painted on both sides of your walls, these products can TRIPLE the effectiveness of the insulation inside your walls right now by increasing its ability to resist temperature changes. So you see, we do not have to tear out the wall to get better insulation anymore!

To lower Summer Cooling bills, put Paint On Insulation on the OUTSIDE of the South and West facing walls, to block the harshest Infrared Radiation from the Sun. If your attic is already fixed, then this should radically lower any air conditioning costs. Of course, if you can afford it, painting all of the outside walls of the house is recommended.

To lower your Winter Heating bills, put Paint On Insulation on the INSIDE of all outside walls. Applying it to other inside walls and ceilings will help heat stay in individual rooms, as well. So, if you "zone heat" your house, and leave unused rooms unheated, applying the Paint On Insulation to all inside walls is the best solution.

I recommend the products at Hy-Tech Thermal Solutions for all of your Paint On Insulation needs. Their pre-mixed products have a wide variety of formulations and special uses, and can be tinted to the color of your choice at your local paint store. If you are on an extreme budget, you can even buy the "ceramic beads" in bulk and mix them yourself with whatever paint you have. While the "do-it-yourself" home mixes aren't quite as good as the pre-mixed products, they work very well. ALL of the people I have

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recommended these products to have been totally satisfied. Their energy costs go down and the "coziness factor" of their home goes way up!

So, up-grading your home's insulation package is STEP TWO.
[Special Note: In addition to this, we are trying to get some of the "high end" commercial products available in a retail format. Stay tuned for more information – we will let you know when this is available to the general public.

Heating System

Many homes have a furnace and ducting system that heats the whole house. These ducts are quite often made of sheet metal and left un-insulated. Getting the heat from the furnace to the rest of your house does not have to include losing a large portion of it to an uninsulated basement before it gets there. The simple solution is to insulate your heat ducting. Since the furnace usually runs in short bursts and then shuts off, the total R-value of the insulation needed on your ducting is relatively low. In fact, one layer of Radiant Barrier with foam core is quite adequate to improve performance considerably.

This picture shows both the **furnace and the ducting** covered in one layer of Prodex Total Insulation Radiant Barrier product. These simple and inexpensive modifications can ensure that when you purchase Heat, you can put it where you want it, and not lose it along the way.

Besides insulation, the performance of old gas and oil furnaces can be improved with new burner systems that are more efficient. Check for up-grades to your model on the Internet. Fuel savings of up to 30% are possible with some newer burner systems.

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Also, you can try to purchase fuel oil or propane on the off-season to try to get the best price. This is also a good idea if you burn wood for heat. Think about energy expenditures on a yearly budget basis, rather than in an "as you need it" basis. Try to plan ahead and avoid buying fuel at the last minute. You might be able to save 15% or more on heating costs just by purchasing your fuel at the right time!

You can also save a substantial amount of money by installing a programmable thermostat. These amazing devices can learn your habits and keep your house in your comfort zone automatically for the lowest possible energy expended. Some manufacturers such as Honeywell claim **you can save up to 33% on heating and cooling** if you use the thermostat as directed. You can see a few options here: Thermostats

Air Conditioning Systems

Just by up-grading your home's insulation, your cooling costs will be lower. But there are still some things you can do to lower your cooling costs even more. If you are in the market for a new air conditioner, you have a number of exciting options.

If you live in a hot climate with high relative humidity, you should buy a new Air Conditioner with the highest SEER rating possible. (To understand the SEER rating, go here: Wikipedia The new SEER 20 technology is available, like the Bryant Evolution System, but anything above SEER 13 has an Energy Star rating as of 2009, and will probably outperform your current AC model.

If, however, you live in a hot climate with moderate to low relative humidity, you can now buy one of the new Coolerado Air Conditioning units. This technology uses a brilliant innovation combining both evaporative cooling and heat exchangers to produce dry, refrigerated air at just 10% of the cost of running a standard air conditioner. These units have a SEER 40 rating, if you can believe that! While other companies have tried to master this technology, Coolerado is the only company I know of that is currently selling a complete product line, world-wide. They have units for rooms, homes, small businesses, and commercial buildings.

Huge cost savings for air conditioning are now possible. If you are in the market for a new Air Conditioner, you MUST see which of these new technologies is right for you..

Ceiling Fans

If you have high ceilings, a ceiling fan can improve your heating efficiency quite a bit. As you know, heat rises and a room with a tall ceiling can be 15ºF warmer near the ceiling than at the floor. A ceiling fan can help recirculate that heat throughout the room. Ceiling fans designed to blow either up or down are recommended. In the Winter, to recirculate heat near the ceiling, have the fan blow UP to force the heat back down around the walls. This gives the best comfort improvement.

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Whole House Fan

In some climates, evening temperatures cool off enough in the Summer to make cooling the house with outside air a real option. One nice method is using a whole house fan. This is usually a fan in the attic that forces air OUT of the house, producing a low pressure inside the house. Then, windows in the bedrooms can be opened, drawing in cool outside air. When the house is insulated well, as I am suggesting, this can replace Air Conditioning in at least some situations.

Summary

The GOAL in all of these modifications to your insulation is to cut the cost of heating and cooling your home by up to 50%. If you can do this, you will have saved a real 25% on your energy bills. Since our over-all goal is to cut your home energy costs by 50%, the savings for heating and cooling improvements can represent up to **half of that goal**!

Links

There are many websites that give recommendations for saving energy. Here are a few:

http://www.doityourself.com/stry/weatheringhighcost
http://www.msnbc.msn.com/id/21527136/

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Chapter Seven - Hot Water

Besides the over-all heating and cooling of your house, the Water Heater is the single largest energy use appliance in your home that produces HEAT. It doesn't matter if you heat your water with Propane, Natural Gas, or Electricity, your Water Heater is grossly under insulated. It is possible to lower the cost of producing hot water in your home by up to **75%**! Adding a proper insulation package around your current hot water heater is, by far, the least expensive solution.

The Budget

Again, knowing how much you are spending for hot water annually is the beginning of understanding your budget. Here is a chart that estimates these costs:

Water Heater Type	Efficiency (EF)	Installed Cost	Yearly Energy Cost	Life (years)	Total Cost (Over 13 Years)
Conventional gas storage	0.60	$850	$350	13	**$5,394**
High-efficiency gas storage	0.65	$1,025	$323	13	**$5,220**
Conventional oil-fired storage	0.55	$1,400	$654	8	**$11,299**
Minimum Efficiency electric storage	0.90	$750	$463	13	**$6,769**
High Efficiency electric storage	0.95	$820	$439	13	**$6,528**
Demand gas (no pilot)	0.80	$1,600	$262	13	**$5,008**
Electric Heat Pump water heater	2.20	$1,660	$190	13	**$4,125**
Solar with electric back-up	1.20	$4,800	$175	13	**$7,072**

Most people have either a gas or an electric Hot Water Heater, and most of these cost estimates are in the $200 to $600 per year range on this chart. Many of the Energy Guide labels that come with new Hot Water Heaters today estimate the cost of running a new Water Heater at about $400 per year, which is near the median cost on this chart. Obviously, if you have a big family, or live in a location where the cost of electricity or gas is very high, then your costs may be higher as well.

Now, if you can increase the effectiveness of the insulation around your Water Heater by a factor of FOUR, you should be able to cut the costs of producing your hot water to about 1/4th of the current cost, so this is well worth doing. If your potential budget for

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this is about $100, then the ROI is less than 6 months. This budget will include insulating the Water Heater and the hot water pipes.

On average, the cost of hot water represents about 8% of your energy expenses. If you can save 3/4ths of this cost, that represents a real savings of about 6% on your home energy bills. So, this is the next, really important insulation up-grade you need to make.

Understanding the Problem

If the thermostat of your Hot Water Heater is set at the recommended 120ºF and the room the Water Heater is in is about 70ºF (or less), then you are trying to maintain a 50ºF difference. So, according to our R-Factor Rule, the insulation jacket around your Hot Water Heater should be at least R-50. But in this case, the way your Water Heater works makes this simple R-50 insulation jacket potentially inadequate. Here's why. You use hot water approximately three or four times a day. Right after you are done, the Water Heater fills up with cold water again, turns ON, and brings the temperature back up to 120ºF. This way it is HOT and ready for use whenever you need it. So, the heat has plenty of TIME, like all night or all day, to seep through the insulation and be wasted.

It is this TIME issue that creates the opportunity for such large energy waste with storage type Hot Water Heaters. As soon as the temperature of the water cools off a few degrees, the thermostat turns the heating elements back on, to raise the water temperature back up to 120ºF. Then the inadequate insulation lets that heat escape, and the cycle repeats all day and all night. Sure, the water is hot when you need it, but the waste is enormous.

Most Hot Water Heaters have less than R-10 insulation inside the tank. Add to this inadequacy, the fact that most units DO NOT have a Radiant Barrier immediately around the water tank inside. This means that Radiant Heat loss is capable of heating up the standard R-10 insulation and rendering this internal insulation jacket much less effective. If the top of the Water Heater is warm or the air around the Water Heater feels warmer, then you know the heat is not staying in the water where you want it. One Water Heater I measured recently was 77ºF on top in a room that was 69ºF. This tells the story perfectly.

Pictured on the next page are two products typically sold as additional insulation for a Water Heater. The product on the right is just "vinyl faced fiberglass" with an R-5 rating against conduction. The product on the left is aluminum foil over bubble wrap, so it has a "radiant barrier" and an R-3.5 rating against heat conduction.

Neither of these products suggests covering the TOP of the Water Heater with extra insulation. Obviously, the product with the radiant barrier will help a little bit more, even though it has a lower R-value rating, but these products will not lower the costs of your Hot Water very much.

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ALL of the Utility Companies, the DOE, and the Energy Audit professionals tell you to add more insulation to your Water Heater to cut costs, but none of them tell you how to REALLY fix the problem of heat loss in the storage type of Water Heaters.

The Real Fix

To really lower the cost of operating your Hot Water Heater, you need to create an insulation jacket that will provide the equivalent of a real **R-50** around it. If you can do this, it will save you more than 75% on your current costs for hot water.

The problem isn't in understanding the need. The real problem is logistics. Most Water Heaters are placed in small closets or near uninsulated basement walls. This makes adding an adequate layer of insulation quite difficult in many situations.

In response to this, we have to get CREATIVE!

We start by assessing the water heater. In our case, it was a 20 year old Kenmore electric with a 52 gallon storage tank. It had TWO INCHES of fiberglass insulation between the water tank and the outer metal skin. (This two inches of fiberglass can be "generously" rated at R-10.) It had already been wrapped with an additional ONE INCH of fiberglass insulation, courtesy of the local utility. (This extra layer of fiberglass insulation can be "generously" rated at R-5.) Here's a picture of what we started with.

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As you can see, the Water Heater is fairly close to the basement wall, and in the lower right corner of the picture, you can see it is right up against the filter and fuel line leading from the fuel oil tank to the furnace. While the top is covered, the front panel is not.

The first thing we did is remove the outer wrap made from fiberglass, and replace it with a tightly fitting wrap of Radiant Barrier product, held in place with Aluminum Tape, as shown in this set of photographs.

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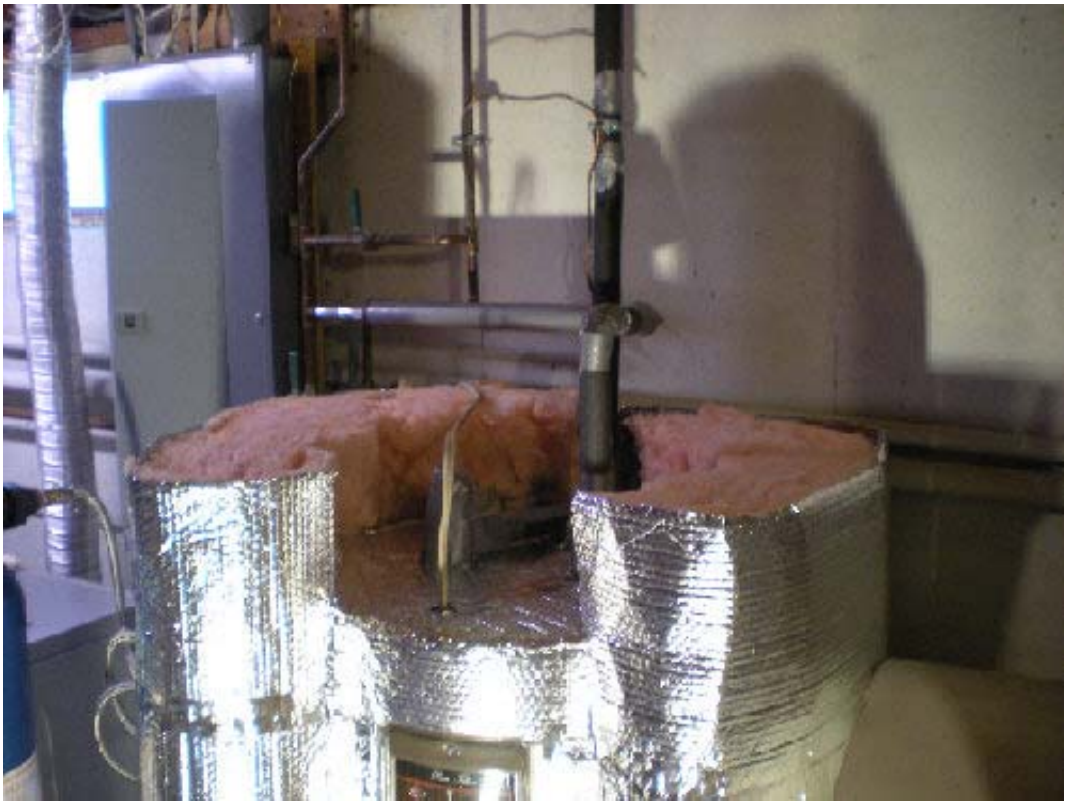
[**SPECIAL NOTE**: When handling any of the fiberglass materials, it is recommended to wear protective gloves, protective eye wear, and a protective mask over your nose and mouth. This prevents any of the fiberglass material from getting in your eyes or lungs.]

The next step was the "creative" choice step, where we decided to use ALL of the available space we had to install more insulation. So, we bought a role of **R-30** fiberglass insulation (pink stuff) normally used for an attic installation. We cut four lengths and wrapped them around the tank with each length stacked on top of the last one. Then, we surrounded it with another layer of the Radiant Barrier material. By the time we got up to the top, here is what it looked like.



As you can see, we have filled the entire area between the Water Heater and the basement wall in the back and the fuel oil tank on the right with our R-30 insulation.

We have also started designing special provisions into this to accommodate access to the oil filter near the floor, as well as the cold water shut-off valve on top that end up "buried" in the insulation. At this point, we have left the front panel exposed because we decided to cover it with a "removable door" of insulation.

The final steps include filling the area above the Water Heater with insulation and fitting the structure with a top made of the Radiant Barrier foil material. Then, we fabricate the door that goes in front and covers the panels that lead to the thermostats inside.

So, here is what our FIX looks like when finished.

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Details include quick access panels to the cold shut-off valve on the cold water inlet pipe, as well as our "door" panel that is hinged on the left with aluminum tape and secured on the right with Velcro strips. The electric power line (romex) is on the outside of the insulation, but emergency "pressure relief valve" is buried.

This FIX now surrounds the water storage tank with:

1. the original R-10 of insulation inside the tank
2. the first layer of Radiant Barrier, which actually consists of TWO LAYERS of aluminum foil and an R-3.5 layer of plastic foam
3. the layer of R-30 fiberglass insulation, and finally
4. the second layer of Radiant Barrier with R-3.5

This brings our FIX up to an R-47 with FOUR LAYERS of Radiant Barrier. Total cost for all of the materials in this insulation up-grade are under $90 and will save the home owner about $300 per year. So, the ROI for this project is less than 4 months!

Resetting the Thermostat

During the installation on the electric unit, we turned the thermostat DOWN because the water temperature at a nearby sink was measuring 124ºF before we started. By the time we finished installing the FIX, the water at the same sink was measuring 130ºF, even though we had lowered the thermostat setting to 116ºF.

The point is that all of the "experts" tell you to lower the thermostat to 120ºF, but what I am going to tell you is to lower the thermostat **AS LOW AS YOU HAVE TO** until the actual water temperature is 120ºF! Don't be surprised if you have to set the thermostat as low as 110ºF (or lower) to get the actual water temperature to be 120ºF. After seeing a number of these situations, I have come to believe that most water heater thermostats are

NOT calibrated very accurately, so the only way to really know is to measure the temperature of the water coming out at a nearby faucet.

Total Materials

We bought all of the materials for this FIX at our local "Home Improvement" store. We used the standard materials available to any shopper including Reflectix Radiant Barrier roles, Aluminum Tape and a 60 square foot roll of Owens R-30 fiberglass insulation, normally used in attics. A similar installation on your Hot Water Heater will require these materials and a Saturday afternoon.

Fix for a Gas Water Heater

The above example showed an electric water heater, but many people have water heaters powered by Natural Gas. These gas appliances have special needs when adding more insulation around them. The most important features are that these water heaters need an unobstructed air flow near the burner area on the bottom, as well as another unobstructed air flow area on the top for the flue.

The following pictures show an excellent example of how to do these modifications properly. This Gas Hot Water Heater was simply wrapped with THREE LAYERS of Prodex Total Insulation. The outside always feels cool to the touch!

Notice the cutaways for the burner unit and the flue. Also, notice that both the hot and cold water pipes are insulated up to 3 feet away from the tank.

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Hot Water Pipes

The next project is to insulate all of the hot water pipes that you have access to. (As you can see from the pictures of our FIX, the pipes in this house had already been insulated.) You may have noticed in the pictures of the Water Heater Fix above, the COLD WATER inlet pipe was also insulated. The reason for this is that the heat from the tank works its way back along the cold water pipe and can be lost along that route.

I recommend insulating the cold water pipe as far back as necessary until the temperature of the pipe is at or below the temperature of the room.

Normally, a foam core pipe covering product is recommended, like the one shown above.

While this is typical, what this is missing is a Radiant Barrier around the pipe.

So, if you use this type of foam pipe covering product, make sure you place some Aluminum foil or thin Radiant Barrier with foam around the pipe before you put the foam pipe covering on it. Here is one product for wrapping pipes that has a Radiant Barrier and an R-4 rating.

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Wrap one layer of this product around the pipe and THEN put the foam core around it. Hold these foam core sections in place with plastic tie-wraps, and you are ready to save money and energy for years to come.

Other Considerations

We showed one FIX on an Electric Water Heater, and another on a Gas Water Heater. Just remember, if you are retrofitting a Gas Water Heater with extra insulation, you must take all of the necessary precautions not to block the exhaust flue or put any materials that might be flammable near the lower burner unit.

Remember, its your house and you are making these modifications. We highly recommend that you monitor the temperature of your water and the insulation jacket you install daily for at least a week to make sure it is working properly. If you find any "hot spots" where heat is escaping, go back in and adjust the insulation until these disappear.

Other Ways to Lower your Costs

Referring back to the chart at the beginning of this chapter, there are three options listed at the bottom of the chart that produce Hot Water at the lowest cost. These are the "Demand Hot Water Heater" run on Gas (without a pilot light), the Heat Pump Water Heater, and the Solar Water Heater with an electric back-up. Whereas the Demand Gas option looks good at first, it really is the least of the three because its efficiency cannot be improved by adding insulation and its real cost of operation in the future is 100% dependent on the price of Gas. Also, if your long range plan is to produce more of your

own energy in the future, its easier to produce electricity for your home, using solar panels or a wind generator, than it is to produce your own gas.

For the money, the Heat Pump option is the best, because a number of companies now sell a retro-fit unit that allows you to CONVERT your current Hot Water Heater to operate on a Heat Pump that only uses about 600 watts. These units cost about $400 and can be installed in an afternoon. This allows you to lower the cost of producing hot water even further. The ROI of this method may be up to 3 years, but with the insulation up-grades AND the Heat Pump heat source, the cost of making hot water for your home can be lowered by over 90% from what you are paying now.

If your motivation is to save the environment, then the most cost efficient way to have hot water is also to install a "solar loop" that could produce hot water from solar energy for free whenever that is available, and then by a Heat Pump as a back-up, and then store that hot water in a super insulated tank.

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Chapter Eight - Refrigeration

The refrigerator in your kitchen is one of the few appliances in your home that runs ON and OFF all day, every day. The general trend in refrigerator design in the last 20 years has been to make the walls thinner and the inside space larger. These visual and space benefits have always been at the expense of room for insulation in the walls and thermal efficiency.

Most foam core insulation has about an R-5 rating per inch of thickness, and most refrigerator walls are about 1½ inches thick. This means that the average insulation package of a modern home refrigerator is a little over R-7. As we discussed before in Chapter 4, a refrigerator is supposed to maintain a temperature difference of about 30ºF all of the time. According to the R-Factor Rule, it takes an effective insulation of R-30 to efficiently accomplish this. It's pretty easy to see that an additional R-20 of insulation will lower the energy requirements of running the refrigerator.

Pictured above is a commercial refrigerator unit, typical of those used in grocery stores. Notice the thickness of the walls. Six inch thicknesses are standard in the industry. With most foam core at R-5 per inch, that makes these commercial refrigerator walls R-30, or essentially, right where I am recommending your home refrigerator should be.

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The first of these modifications were pioneered in Off-Grid solar homes where electric power was at an extreme premium. Adding a layer of R-19 Pink fiberglass insulation to the outside of a standard refrigerator and then building a stylish wood panel enclosure around it worked much better than expected. Total power consumption dropped by 75% and cooling settings inside the refrigerator had to be turned down, or the food would freeze.

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But modern refrigerators only require about $40 worth of electricity per year to run, and most kitchens have the refrigerator sandwiched closely between cabinets. So there is no room to add 5 inches of insulation to each side. The other problem is that most of us are not trained cabinetmakers. The final issue is aesthetics. I know my wife will NOT put up with having an ugly box around the fridge in "HER" kitchen! So, costs and benefits are not the only considerations when modifying the home refrigerator.

The Budget

The cost of running the refrigerator is only about $40 per year. So, if the cost can be lowered by 75%, then we have a budget of just $30 to spend if we want an ROI of one year. If just saving energy is your motivation, then the amount you spend on this can exceed $30, since the ROI is less important. So where is the biggest bang for the buck? This gets interesting.

Regular Maintenance

There are three things that you should inspect on your refrigerator to ensure proper operation. The first is the heat rejection coils; are they clean and free of dust. The second are the doors; are they mounted properly on their hinges so the doors close flat and square. The third is the door seals; are they clean and free of defects or damage.

Heat Rejection Coils: In getting to know your refrigerator, the first thing to look for is the location where it is trying to get rid of the heat it has removed from inside. Currently, there are three different ways a refrigerator may get rid of it's excess heat. The older models have external coils, like a big black radiator, against the back wall. But the newer models have their heat rejection radiators mounted underneath the bottom. These newer types use two different methods to vent the heat. Some draw cool air in from the front (below the door) and blow it out the back, using a fan. The other type splits the airflow along the bottom and draws cool air in one half of the front and blows hot air out of the other side of the front. Each of these three types has its own special maintenance needs. So, the first thing you need to do is determine which type your refrigerator is.

The Utility companies tell you to "vacuum the dust" off of the coils to improve the performance of the refrigerator. They usually show the older type with the big radiators on the back. Interestingly enough, this style usually has the least dust build-up of the three, but is certainly the easiest to show on TV. The reason is simple. The heat flows off of the big radiator by convection, simply heating the air nearby and rising away. The other two designs require a fan to blow air over the smaller heat rejection radiators. This means that much more dust laden air is drawn into these areas, so dust build-up is much more critical to remove in the modern units.

No matter what type of heat rejection coils your refrigerator has, the most important thing you can do is keep them clean. The reason is simple. The sticky, oily dust that builds up on these coils acts like an *insulator* and makes it harder for the system to reject the heat.

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Here is the one place you DON'T WANT any insulation, so the air flow can take the heat away easily and efficiently.

Cleaning the coils on the bottom of the refrigerator is a bit difficult, but it still needs to be done if you hope to get an efficiency improvement. The following picture is typical of what you might find when you take the lower panel off the back of your refrigerator. This may look scary, until you see yours!

No matter which design of refrigerator you have, the entire mechanism should be inspected at least once a year and any dust build up on the fan, compressor, coils, thermostat, and other tubing should be removed. And while you are in there cleaning, be careful. Don't bend or break anything!

The Doors and Seals: If the door hinges are out of adjustment, the refrigerator or freezer door will not close properly, and cold air inside will be able to escape easily. This will cause the system to run almost continuously and cost you many times more than necessary to keep your food cold. To adjust the hinges, just slightly loosen the hinge mount screws or bolts as they mount to the refrigerator, and carefully adjust the position of the doors. When the doors appear to mount flush against the frame, just tighten the bolts again, and you are done.

The door seals should also be carefully inspected. Make sure the entire surface of the seal and the refrigerator front edge are clean and free of food or sticky goop. Any food residues should be washed off with a warm, soapy water and the entire seal dried. Also, if the seal is torn or ripped in any location, this can cause significant leaks of cold air out

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of the refrigerator, raising the cost of operation. If the seal is damaged, it should be replaced as soon as possible.

The Fix

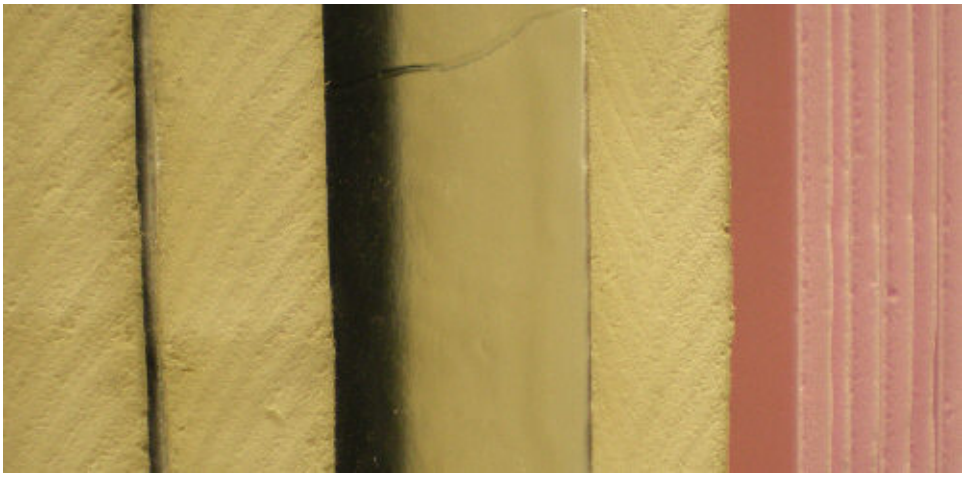
The real fix, of course, is to add more insulation around the refrigerator. Each model is different, so use your own best judgment on how you adapt these recommendations. If you have the opportunity to maximize your modification, we recommend the addition of at least R-20 more insulation AND the addition of a Radiant Barrier on the outside. This can add up to FOUR INCHES of thickness to the walls of your refrigerator, but this is the best, over-all energy saver.

Also, DO NOT add extra insulation to any surface of your refrigerator that is WARMER than the temperature of the air. [See warnings related to Upright Freezers.]

Because most modern kitchens have the refrigerators sandwiched into very tight spaces, we are going to recommend a more "practical" fix that will improve the efficiency of your refrigerator significantly AND only add ONE INCH of thickness to the outside walls.

The Back: If you have the older style with the external heat coils in the back, install one layer of Radiant Barrier, like Prodex Total Insulation, between the back of the refrigerator and these coils. This dramatically reduces "re-absorption" of the heat back into the refrigerator through the inadequate insulation in the back wall. If you have a more modern style with an open, flat back, then just install one layer of foam core board to the back, like the sides and top listed below.

Sides and Top: The next thing to do is to use the **one-inch thick**, aluminum foil covered foam board (like R-MAX ThermaSheath-3), shown in the center of the photo below, to increase the insulation on the side walls and the top.



Make sure to cut the foam board carefully to produce clean, square edges that are the correct dimension. Use aluminum tape to secure the panels to the refrigerator and cover

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up the foam exposed on the edges. This only adds two inches of total thickness to the refrigerator, but adds TWO layers of Radiant Barrier and another R-7 Conduction Barrier to these surfaces. This should TRIPLE the insulation efficiency.

Front Doors: Putting more insulation on the doors is optional. Obviously, for thermal efficiency, it is recommended, but for aesthetics, it might LOOK BETTER if you leave the front appearance alone. Also, if you like using the little "refrigerator magnets" to hold notes and other messages on the refrigerator, then definitely, leave the doors alone. The magnets won't work on the newly insulated surfaces, since there is no steel in the foam panels. So, if the front of your refrigerator is a "family message center" then definitely, leave it alone!

Variations on this theme have worked very well and lowered power requirements by up to 75% for the refrigerators so equipped.

Special Considerations: One other consideration is worth looking at if you have a refrigerator that vents its hot air out the bottom, at the back. This design has a tendency to produce a relatively large amount of warm air that can end up trapped behind the refrigerator IF it is pushed all the way back against the wall. If you have this style of refrigerator and you own your own home, consider installing a vent to allow this warm air to exhaust to another area of the kitchen. This may or may not be practical. If not, then at least make sure that your refrigerator is at least a few inches away from the back wall, so the warm air can circulate out from behind the refrigerator more easily.

Final Appearance

The last issue is the over-all appearance. Since the insulation panels have an aluminum foil covering on them, you end up with a SILVER colored refrigerator when you may have started with a WHITE one. To handle this, there are a number of possible solutions. The first is that thin sheets of white plastic are sold at "Home Improvement" stores and used as wall or counter-top paneling. One sheet of this material can be purchased, panels cut to size, and used to cover all surfaces that may show in the kitchen. This will provide a finished appearance similar to the original. Corners can be finished with a white plastic molding designed to cover outside corners.

Super Budget Fix

If you are a "bachelor" or student on a budget, and you want to reduce the cost of running your refrigerator without spending very much money, you can MAKE your own insulation board out of cheaper materials. With just a stack of old corrugated cardboard boxes, some aluminum foil and a can of spray glue, you can make your own! Just remember, most insulation is just a material that "traps air" very well, like Styrofoam. Ten layers of corrugated cardboard can serve this function nicely, and cost very little. Just remember to add some aluminum foil to the outside, as the final radiant barrier!

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Fix For Freezers

This type of installation for deep freeze units is even more important, since they must maintain an even higher temperature difference and can cost up to $80 per year to run. Unfortunately, the FIX we are recommending, that includes ADDING INSULATION to the OUTSIDE of the refrigerator, CANNOT BE USED with some freezers!

In general, the kind of freezers that cannot be improved by adding insulation to the outside are the UPRIGHT FREEZER style. These units can be identified by two specific features. First, they have NO VISIBLE heat rejection coils, either on the back or underneath. Second, the side and top panels get quite warm while the unit is ON, with the top capable of reaching 100°F on occasion. These units actually have the heat rejection coils DIRECTLY underneath the side and top panel skin.

Adding insulation to the outside walls of these units will only trap the heat in the freezer, and could severely damage the unit.

These units can only be re-insulated if the insulation is added to the INSIDE of the unit. Some upright Freezers are set up like the refrigerators that we discussed before, with a heat rejection coil on the back or bottom. These units may be used with the following instructions. Also, most Chest Style Freezers, with doors that open on the top, can be improved by adding insulation to the side and top surfaces.

The bottom line is this: if you can SEE the heat rejection coils, either on the back or underneath the freezer, you can use this modification. These heat rejection coils will look like a black radiator, that is hot to the touch, when the unit is operating. If you cannot SEE the heat rejection coils anywhere, then they are probably INSIDE the side panels and you CANNOT use this modification without damaging your freezer.

For freezers that can be modified, we recommend adding TWO inches of regular Expanded Polystyrene foam (R-10) and TWO inches of the R-MAX ThermaSheath-3 with the aluminum foil on both sides (R-13). This will add two layers of Radiant Barrier and a real R-23 of Conduction Barrier. It adds about 4 inches of thickness to the walls, but that is where they should be anyway. If these freezer units are in your garage or basement, the added wall thickness should not produce an "appearance" problem, and will save you hundreds of dollars over the life of the appliance.

Install the added insulation on the sides, top, back, and doors. Make sure the added insulation does not interfere with the normal operation of the door or door seals. Also, make sure the heat rejection coils are clean and free from dust build-up, like the refrigerator example above.

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Alternative Fix

There is one more idea that can be used, and that is to just paint the surface of your refrigerator with multiple layers of the Paint On Insulation. If you do this, five or six layers, with plenty of time for each layer to fully cure, should work pretty well. A wide variety of "home-made" fixes like this have been successful. Most methods that include both more insulation and a twin Radiant Barrier lower the cost of running the refrigerator or freezer by 75%.

Final Thoughts

In a walk through of the Rocky Mountain Institute, Amory Lovins states that his refrigerator uses only 8% of the energy of a normal refrigerator (92% savings) and his freezer only uses 15% of the energy of a normal freezer (85% savings). He attributes this to the thick insulation in the walls, and the design that effectively moves the heat away from the "cold box" so it cannot be easily reabsorbed. It's as simple as that!!! Now you know, and you can do it to.

OK, this concludes the work on the "Big Heat" items. The next thing to look at is the Lights.

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Chapter Nine - Lighting

Lighting represents up to 13% of your energy bills, so it is the next major area to explore for ways to ***Save on Home Energy***.

Electric Lighting is one of the modern marvels we have learned to take for granted. The very first experiments that produced light by the agency of electricity date back to 1809, when Sir Humphrey Davy produced the first Carbon Arc Lamp. But it took the development of the "glowing filament" bulb, by Thomas Edison and Joseph Swan, and its mass production by the Corning Glass Company, for the electric light bulb to became inexpensive enough to be used in a residential setting. The incandescent bulb was "perfected" in 1917 with the development of the Tungsten Filament bulb that would run for hundreds of hours before burning out.

That was just 5 generations ago. Since the venerable old "incandescent light" came into general use, literally dozens of other methods have been devised to produce light by the agency of electricity. Some of the most notable of these include the Neon Light, the Mercury Vapor Light, the Sodium Vapor Light, the Fluorescent Light, the Quartz-Halogen Light, and the latest, the Light Emitting Diode (LED).

Lighting Efficiency

Every one of these methods produces light at a different efficiency when compared to how much electricity it takes to run them. Because of costs, brightness, heat produced, and other factors, the only lighting methods that have been used extensively in the home are the incandescent light and the fluorescent light. All other systems have been used to a much lesser degree.

The simplest way to determine the "efficiency" of a light bulb is to compare the light output, measured in LUMENS, to the amount of electricity it uses measured in WATTS. This creates a simple standard expressed as LUMENS per WATT.

A typical incandescent light bulb that draws 100 watts only puts out about 1600 Lumens, or a paltry 16 Lumens per Watt.

One of the new Compact Fluorescent Lights (CFLs) draws 28 watts to put out about 1600 Lumens, so it can produce light at a rate of up to 57 Lumens per Watt. This is three and a half times more light for the same amount of electricity, OR the same amount of light for only 28% as much electricity. So, for the easy, screw in type of light bulb, switching to the new CFL bulbs can definitely lower your electricity use and produce sizeable energy savings.

But Fluorescent Tube Lights have always been more efficient, and their efficiencies continue to rise. The new T8 Fluorescent Tube fixture systems with electronic ballasts can

produce up to 2500 Lumens for a meager 25 Watts of electricity. That is 100 Lumens per Watt! This is the highest efficiency of any lighting fixture available for residential light purposes. Over-all, T8 bulbs vary from 85-100 Lumens per Watt, depending on their spectral output. In contrast to this, the standard **T12** Fluorescent tube lights produce about 60-65 Lumens per Watt, which is closer to the CFLs.

What this means is that the CFLs, while being more efficient than the incandescent bulbs, are not the most efficient lighting sources available today. By using them to replace an incandescent bulb, a CFL can lower your electric usage for the same amount of light, while using a lamp or other fixture you currently own. If you are putting in new lighting fixtures, however, consider the new T8 Fluorescent Tube lights with electronic ballasts.

Drawbacks to CFLs

As of March of 2009 in the USA, the CFL light should NOT be considered a mature technology. While this technology is perfected and available in Europe and New Zealand, these advanced CFL bulbs are currently NOT available in the US/Canadian Market. The particular problems that our CFLs have fall into three main categories.

The first problem relates to the QUALITY of power these bulbs draw from the power line. Most of these bulbs draw a very low .55 power factor, introduce "harmonic distortion" onto the power line, and even have warning labels describing possible RADIO INTERFERENCE from some models.

Add to this the fact that the glass used in some of these bulbs does NOT properly block the strong Ultra-Violet light (UV) that they produce, and it is possible to get unusual rashes or even severe "sunburn" type effects from them if you have improper exposure. For more on this, go to this link:
http://vodpod.com/watch/1270032-just-how-safe-are-cfl-light-bulbs

Finally, many CFLs have relatively high amounts of Mercury in them, and so pose a larger environmental risk than necessary. Granted, ALL fluorescent bulbs have Mercury in them and ALL fluorescent bulbs need to be disposed of properly, but the incandescent bulbs didn't have any of these problems and so people are not used to dealing with them with regard to an "ordinary" light bulb. For more information about this, go to this link:
http://www.ewg.org/reports/compact-fluorescent-light-bulbs

All of this requires the public to become "more educated" about this new technology. The CFL is not just about saving energy. There are other issues.

There are a number of companies who understand all of these issues and are scrambling to bring the advanced CFL light bulbs to the US market. As soon as they are available, we will have them in our ***Save on Home Energy*** STORE coming soon…

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Other Ways to Save

One way we waste electricity is to leave lights ON in empty rooms. It may seem "cozier" for the whole house to be lit up, but it does represent one way you can save on your electric bill that is completely within your control. One way to handle this issue is with "motion detectors", timers to turn lights out after a certain time, or "dusk to dawn" sensors that turn lights ON only when it is dark outside.

Motion detectors are a great idea for hallways, laundry rooms, closets, garages, stairways, and yard lights. In areas of the home that are usually dark, like hallways, basement stairways, or large walk-in closets, motion detectors are ideal. They automatically turn the light ON right when you need it, and OFF soon after you leave. Connected to "dusk to dawn" sensors, yard lights would only come on after dark IF someone moved into the area needing the light.

There are also technologies like GREEN SWITCH that can be programmed with all non-essential loads in the house, so they may all be turned OFF with one master switch at the front door. If you live alone and work out of the house, this may be an excellent option.

The Future of Lighting

Lighting technology is advancing very rapidly right now. The next big breakthrough coming is with the LED technology. Right now, the LEDs are where the CFLs were about three years ago. Both the efficiency and brightness of LEDs are coming up, and the prices are coming down. As these trends continue, the availability and affordability will be rising as well.

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Currently, LED lights are available for night-lights, flashlights, and battery powered closet lights. Some even have a motion detector built in to save energy even more. One of the major benefits of LED Lights is that they run for up to 100,000 hours, so almost never need to be replaced.

Currently, the biggest drawback for LEDs is that they produce their very bright light in relatively narrow beams. So, they are not practical yet for full room lighting. But they are making huge changes in the lighting markets where this is not a problem.

LEDs are already used widely in the new generation Traffic Stop Lights, and automotive and truck lighting. Watch for LEDs to become affordable for desk lighting and counter top spotlights soon, with whole room lighting coming in a few years.

Conclusion

Currently, if you trade out all of your incandescent light bulbs and replace them with CFLs, you could probably lower your electric energy use for light by 50%. This is not as big a savings as much of the media suggests is possible, but it is still a significant amount, and this figure is more accurate in real terms. Bigger savings are available by switching to T8 fluorescent fixtures wherever possible or LED systems.

Natural Light

But don't forget the SUN!!! Natural light is available during normal daylight hours and can be used to light your entire house if you install skylights or light pipes in hallways and interior rooms that do not have windows. If you want to save money, these options may not be cost effective, but if you want to save energy, and increase the value of your home, then skylights and light pipes are an excellent investment. Many of these fixtures can also be fitted with an artificial light sources, so the same "light dome" in the ceiling will provide light, day or night.

Here are some examples of skylights and solar tube lights: Solar Lights

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Chapter Ten - Cooking

Cooking is another significant use of HEAT energy in the home. When I grew up in the 1960s, having an "electric range" in the house was a wonderful convenience. Just not having an "open flame" in the kitchen was also considered a "safety feature".

The standard model of electric cook stove and oven hasn't changed much since 1960. The spiral heating elements on the top of the stove take four or five minutes to heat up to operating temperature, and so do the elements in the oven and broiler. All of this "warm up time" is wasted energy. Newer models have coiled heating elements under tempered glass that heat up in a few seconds. So these newer stoves are much more efficient and waste far less electricity.

Still and all, many cooking operations simply don't need either a full sized oven or even a full stove heating element to "get the job done". To take their place, a host of specialized cooking appliances have made their way into our kitchens. Using the right cooking appliance for the right cooking situation is the best way to ***Save on Home Energy*** in the Kitchen.

One good example is the "Rice Cooker". This is a wonderful, automatic appliance that cooks rice perfectly, first time, every time. It plugs into a standard outlet, and turns itself OFF when the rice is cooked to perfection. Of course, if you don't eat much rice, there is no sense in having one!

Toaster ovens can be more cost effective than using the full sized oven, but they have limits to what can be cooked in them. Many of them are not recommended for cooking a Pizza, for instance. But they are good for a baked potato, and re-warming left-overs. If you become familiar with their use, they can be quite economical to use.

Microwave Ovens are used quite a bit, and they do use less energy than other cooking appliances. The down side of the Microwave Oven is that it also destroys enzymes in the food, which makes the food less nutritious and more difficult to digest. So this is an example of an "energy saving device" that really isn't worth the energy savings! I haven't owned one for many years.

The Crock Pot is a wonderful, low cost cooking method. A 200 watt heating element slowly warms a roast, soup or stew for 8 hours, creating a rich blend of tastes that "fast cooking" can never achieve. Most meals can be cooked with less than 2 kWh's of electricity, or under 15¢.

One of the great innovations of the last 10 years is the "double sided grills" that drain extra fat out of foods. Made famous by George Foreman, these grills can cook a steak in 3 minutes, or toast a cheese sandwich in 2 minutes. Having a small grill like this in the

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home can replace using the stove top burners in many situations, with energy savings of 80%.

Hot Air Popcorn Poppers and other specialty-cooking appliance can make cooking fun and cost effective. If you don't already own them, you can find many of them at bargain prices at yard sales and Thrift Stores.

So, there are ways to reduce the amount of energy you use in the cooking process. But in all reality, the monetary savings are quite small.

If you want to eliminate the cost of cooking altogether, consider purchasing a Solar Oven! These remarkable appliances can cook dinner, bread, roasts, cookies and a wide variety of things for FREE. They can be used any time of year, regardless of the outside temperature. Best times for use are mid-day, of course, but if saving energy is your goal, having the ability to cook your meals without gas or electricity is worth exploring.

A number of different Solar Ovens are available here: Solar Ovens

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Chapter Eleven - Clothes Washer, Dryer, and Dishwasher

The Clothes Washer

This appliance does not offer very many opportunities to save energy. The simplest way is to wash your clothes in COLD water whenever possible. New detergents work pretty well in cold water, so it is a viable option. So, the main savings, using the clothes washer you currently own, is to avoid using energy to make Hot Water. Also, make sure you set the wash size according to the actual size of the load. The drive motor has to slosh all of that water around, so less water means less energy used by the motor.

If you are in the market for a NEW clothes washer, definitely buy a FRONT LOADING model. This type of clothes washer uses at least 75% less energy to wash your clothes. One comparison I did recently showed a New Top Loading Washer used $66 of electricity per year whereas a New Front Loading Washer used just $12 of electricity per year. This is an 82% energy savings, and a savings of $54 per year. The down side of this is that the new Front Loading Washers generally cost about $1,000, so the **ROI is about 18 years**. The energy savings are significant, but the over-all cost savings are not so good when the cost of the new washer is factored in.

Obviously, the ROI is a lot sooner if you have a big family and do laundry every day. The cost of a new washer can also be lowered if you shop for discounts or buy from a "ding and dent" center in your area.

When looking for a new washer, also look for a model that has a VERY HIGH-SPEED SPIN cycle. This gets most of the water out of the clothes before you even put them in the Clothes Dryer, so this feature also saves money and energy.

Also, if you are interested in Saving the Environment, you should use Phosphate Free detergents. And speaking of detergents, most people use TOO MUCH detergent in the wash. From a Science point of view, a detergent does two things: first, it lowers the surface tension of the water, making the water itself a better solvent; and second, it allows oils to be emulsified in water so they can be removed from the clothes. This is ALL soap normally does.

Contrary to popular belief, the "soap" does not actually "clean the clothes". Since it is the lower surface tension WATER itself that lifts the "dirt" out, you don't need a lot of detergent to act as a bridging agent to lift the oils out. Start by using HALF as much detergent as the manufacturer recommends, and see if your cloths don't come out just as clean! This saves you money and puts less of these products into the environment.

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The Clothes Dryer

There are a few ways to lower the cost of drying your clothes. The first and most important thing is to make sure your lint filters are cleaned regularly and that the exhaust flue is clear of lint build-up. If your main lint filter needs to be replaced, you can find a replacement filter here.

Lint build-up in the exhaust duct of your Clothes Dryer is the major reason clothes take longer to dry! To save money and energy, this maintenance on the dryer exhaust duct must be performed AS OFTEN AS IS REQUIRED to keep the duct wide open. If the duct clogs up often or easily, you may want to figure out WHY, and repair the problem in a more permanent way.

One thing you can do is buy a set of special brushes to clean the dryer exhaust flue available here: Dryer vent cleaning system

Another thing you can do is add a by-pass valve to vent the hot exhaust air back into your house. There are a number of "external lint filters" that you can install to safely remove the last bits of lint dust. This allows you to vent the excess heat and moisture back into your home. In the winter, this can be quite useful. In the summer, you may wish to continue to vent the dryer to the outside. By-pass control valves allow you to do both, and can be purchased here.

For indoor lint traps, go here: Lint Traps

The next way to save energy is to further insulate your dryer. These machines do not have very much insulation and you may have noticed that they get warm on the outside when in use. Adding insulation on the outside of your Clothes Dryer can help keep that heat inside the machine, where it will dry your clothes! If you decide to insulate the dryer, use a foam board with a radiant barrier, and cover the back, top and sides. Make sure to leave access to your lint filters and exhaust ducts unobstructed.

SPECIAL NOTE: If you add insulation to the outside of your clothes dryer, it becomes even more important that your exhaust duct remains wide open and unobstructed by lint build-up. The reason for this is that the exhaust air will be coming out at a higher temperature and therefore there is a greater risk of **FIRE** if there is lint in the duct.

If you live in a very dry climate, you may be able to dry your clothes quite effectively using only the "air fluff" cycle, and not using any extra heat. After all, the extra heat in a standard clothes dryer is just used to raise the ability of the air to hold more water. If the air is already very dry, warming it further to make it relatively "drier" may not be necessary. Any day the relative humidity is below 30%, you should be able to dry your clothes without any extra heat.

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One option is buying a "hydronic" attachment for your dryer, like the one sold by Dryer Miser. This technology lowers the total heat necessary to dry your clothes by lowering the relative humidity in the air. This costs about $300, so while it does save energy, the ROI is a couple years. It's great technology, though and if you want to Save Energy, this is a great way to dry your clothes.

The other option is the age-old, "tried and true" clothes line. Yes, hanging your clothes out to dry is the cheapest, most cost effective option. This, of course, does require a "life-style" change, which you may not be willing to make.

The Dish Washer

Your dishwasher offers a few ways to save energy. The first one is that most models offer an option to make the water even hotter than your Hot Water Heater provides, using an internal heat booster. Just shut this feature OFF, as it is not necessary and does not offer an added benefit with regard to how clean your dishes get.

The second suggestion is to just "scrape" the dishes of the large food items, and do not "pre-rinse" the dishes before you put them in. This wastes time and water, as most modern dishwashers are fully capable of cleaning the dishes completely.

The third suggestion is let the dishes "air dry". The rinse water is usually hot, and so the dishes are warm already. The "dry cycle" of the dishwasher actually takes the most energy and is just not necessary to add more heat to this most of the time, especially if you wash the dishes in the evening and don't plan to empty the clean dishes until morning. Used this way, simply letting the dishes "air dry" saves a lot of energy and gives you the same end product. Some models have a switch on the front panel to turn the Heat on the Dry Cycle ON or OFF. See if your Dish Washer has this feature. If it does, just turn it OFF. If not, just STOP the wash cycle after the last rinse, and advance the control to the end.

To help Save the Environment, use only Phosphate Free dish washing soap, and use only half as much as recommended.

By implementing all of these measures, you can save a few percent on your energy bills.

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Chapter Twelve - Electronics

These days, our homes are littered with electronic gadgets. It seems like there are new gizmos showing up all of the time. Currently, the average home uses over 20% of its electricity to power this growing list of stuff. Most of these things we only use once in a while, so turning off the ones we aren't using can save some energy, for sure.

Here is a current list of electronic devices that use Electricity Directly.

TV
Video Recorder (video tape, DVD, Blue-Ray)
Stereo Music System
Computers
Printers
Scanners
Monitors
Fax Machine
Clocks
Speaker Phones
Cordless Phones
Cell Phones (Blackberry, etc.)
MP3 Players
Battery Chargers for Cameras, Cell Phones, Portable Tools, etc.
The list goes on....

Phantom Load

You have probably heard the term Phantom Load. It is becoming a common phrase. It refers to electronic appliances that still draw electrical power when they are OFF. Normally, when something is turned OFF, it stops using any energy, but not for these devices.

Here's how this situation started. Back in the early days of Television, the TV screen technology that used a Cathode Ray Tube (CRT) took up to two minutes to warm up before the picture appeared. So, you would turn ON your TV and you could start watching in about TWO MINUTES. When the color televisions appeared in the 1960's, the warm-up time was even longer.

It was discovered that if the CRT was left ON at very low power levels, when the TV was turned ON, the picture could be made to appear in just a few seconds. For people who had paid a fortune for a color TV in those days, the "Instant On" feature was like HEAVEN. No more waiting for the CRT to warm up. It only took a few watts of

electricity to keep the picture tube in "warm shut-down" mode, so the trade off seemed like a good idea. Phantom Load started as a "convenience".

Anyway, that is how it started. Today, you have a wide variety of appliances that have power supplies in the back that never turn off. Many of these devices have little electronic clocks on the front panel and if they were ever really turned OFF, you would have to reset the clock, like you do after a "power outage" event.

It is now estimated that Phantom Load represents up to 3 kWh of power a day. If you pay 9¢ per kWh, that is 27¢ a day, day after day, or about $100 per year! So you can see, this issue is worth looking at. If you purchased a little Electric Power Meter like I recommended earlier, you can see how much energy each of your appliances is drawing "when it is OFF" for yourself.

Energy Savings verses Loss of Functionality

Remarkably, the new HD LCD TVs don't need any warm up time, so these appliances can be turned OFF completely without losing functionality. But this is NOT true of your Cordless Phone base stand or your Video Recorder. If you unplug or turn these devices totally OFF, they stop providing their primary function.

In the case of your Cordless Phone, it needs power to send the phone signal to the handset and to charge the battery when the phone is resting in the cradle. And it needs to be ready to do any of this at a moments notice. So, it really needs "stand-by" power all of the time, or it stops providing its primary function.

This is also true of your Video Recording device. If you can't program it to tape a show when you aren't home, then you have lost some of its functionality.

Take a look around your house. Anything with a little electronic clock on it is really ON when it is OFF. These little clocks normally take only about ONE HUNDREDTH of a Watt to operate, but the stand-by mode of the appliance they are a part of is drawing one or two watts. So, to keep the clock on, you are using 200 TIMES more energy than is required to run the clock! So, there is direct waste of electricity all over your home.

Remote Control

Any electronic device that has a remote control feature is really ON when it is OFF. If you can turn the device ON using the remote control, then it is really ON in stand-by mode all of the time. For the TV, this may be useful, but is it really necessary for your Stereo system, and your ornamental Gas Fireplace?

The main "Rule of Thumb" with this situation is: if it turns ON with a "soft switch" or a Remote Control, it is always ON and producing a Phantom Load. If you learn to turn things totally OFF, there is real money to be saved.

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Your Computer

I know people who leave their computers on all of the time. We've all been told that "turning the computer on and off is bad for it". That may have been true of earlier, unstable operating systems, but today, computers are electronically and operationally robust devices. Turning your computer OFF when not in use doesn't hurt it.

For convenience sake, the "boot up" process can take a couple of minutes, what with virus scans and the like, so leaving the computer ON during the day has become a "life style" necessity. But at least the computer is turned OFF at night. Or is it?

My wife found that her Canon printer used up its ink THREE TIMES FASTER if it was turned ON and OFF every day. Apparently, when the printer turns on, it goes through a diagnostic cycle and purges the ink jets. Once this was understood, it was obviously CHEAPER to leave the printer ON all of the time than buy three times more INK. My printer doesn't do that and I only print things periodically, so I only turn my printer ON when I am going to print something, and leave it OFF the rest of the time.

Recommendations

Turn OFF everything you are not using that does not provide some on-going function. This includes all battery chargers when you are not charging the battery. This does NOT apply to Cordless Phones, but it does apply to Cell Phone chargers, Digital Camera chargers, MP3 chargers, and Portable Tool chargers.

There are new Smart Strips available that allow you to leave these chargers plugged in, but turn them OFF completely when they would normally be in "stand-by" mode. Then, when you plug the battery in to be charged, the Smart Strip senses the power requirement, and turns the charger ON. The electronic power requirements for this "sensing" function in about 1% of a watt, so it costs about 5¢ a year to run the Smart Strip.

There are also Green Plugs, Green Switches and other systems that can shut off "non-essential" circuits in your home when you are not there. A complete list of these types of energy saving aids is available at our store coming soon…

The Obvious...

Oh yes, I almost forgot to mention the most obvious category. Whenever you can, turn OFF appliances when you are not in that room. This includes lights, of course, but also TVs, Music systems, Video Games, computers, heaters, and anything else that uses energy. Just be mindful that *everything* that uses electricity is something you are paying for. The most efficient way to use these appliances is to enjoy them when you need them, and when you are done, just TURN THEM OFF.

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Chapter Thirteen - Saving Water

Saving Water is good for the environment but if you are connected to a municipal water system, you are probably billed in blocks for water use. Many billing systems provide a minimum block of up to 10,000 gallons a month for the minimum billing amount. Even if you use less, the billing amount is the same. In the same vain, if you use one gallon more than the billing minimum, you must pay for the next block of water, whether you use it or not. Knowing where your water use is within the billing method is a good idea, especially if you are close to the limit.

If you are on your own well system, then you pay for the electric power to pump all of your water. In these situations, saving water equals saving energy, so it's a good idea to look at some of these ideas. Even if you are on a municipal system, they might be worth implementing because they might be able to save you money, as well.

Shower Head

The first and foremost money saving idea is the LOW FLOW SHOWER HEAD. The main way this saves you money is by using LESS hot water during a shower. Dozens of designs are available that use about 1½ gallons of water per minute. Anything more than this rating should not be considered "low flow". Many of these shower heads produce a weak stream of water that is insufficient to rinse your hair after using shampoo. Unfortunately, every model is different and you may have to buy (and return) a few to your local Hardware Store to find one that is right for you. For your convenience, here are some Low Flow Shower Heads.

Toilets

Since toilets run on cold water, there are no real "energy saving" models for toilets. But there are a wide variety of low volume flush toilets, split flush systems for liquids only or liquids and solids, and even toilets with built-in sinks.

The main problem in switching to a low volume flush toilet is your existing plumbing system. If your toilet is very close to the main sewer line, a low flush system may not cause any problems. But if your toilet is at the end of a long, shallow sewer line with no other sources of water adding to the flow, a low volume flush system may just clog up continuously for a lack of sufficient water to carry the solids down hill to the main sewer line.

Make sure you understand how your sewer line is going to manage the change if you switch to a low volume flush system. One answer to this problem is Flushmate. Flushmate is an ingenious technology that allows a low volume flush toilet to operate with a long, low angle sewer line. It does this by pressurizing the flush with the incoming water pressure.

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Clothes Washer

As we said before, the front-loading clothes washers use much less water to clean your clothes than the top loading variety. If saving water is a priority for you, then consider this the next time you purchase a washing machine.

Simple Things

By now we have all learned to turn the water OFF while we brush our teeth, using only a little water to wet the brush, and a little to rinse at the end. This is also true for washing vegetables and hand washing dishes that don't go in the dishwasher.

Plants and Irrigation

A home is always a more inviting place if someone loves and cares for some flowering plants. Also, growing vegetables in a Summer garden can be fun, nutritious, and a source of inexpensive, fresh food. While watering houseplants is best done by hand, watering a garden is best done with drip irrigation, or other methods that focus the water on each individual plant, instead of the entire garden area.

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Section Four - Costs and Benefits

or

The Ancient Art of
Paying the Least and Getting the Most

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http://www.save-on-home-energy.com

Chapter Fourteen - Where Should I begin?

Knowing where you use and waste energy is the beginning. Knowing what technologies are available to address the savings issues are next. Finally, applying this knowledge to your motivation for SAVINGS leads directly to YOUR best course of action.

Here again are the main recommendations to ***Save on Home Energy*** and the list we believe represents your best possibility to save the most on your energy bills.

1) Find and fix all air leaks, including windows, doors, chimney, etc.
2) up-grade insulation and add radiant barrier in these parts of the house
    the attic
    the outside walls
    the basement walls
3) up-grade insulation and add radiant barrier for these appliances
    water heater and hot water pipes
    furnace and ducting
    refrigerator and freezer
    clothes dryer (and keep the lint flue clean!)
4) Lighting up-grade
    T8 fluorescent lights
    CFLs
    LEDs
    motion detectors, programmable timers, etc.
    smart switch
5) Furnace and AC equipment maintenance
    change filters, burners, etc
    buy fuel when prices are down (oil, wood, propane)
    programmable thermostat
    more efficient appliances if replacement is necessary
6) Turn Off unused stuff
    computers, printers, battery chargers
    don't light empty rooms
    don't heat empty rooms
    don't leave TV on in empty rooms
7) Cook with an appropriate appliance

While the biggest savings are available in the first FIVE categories, there are still significant savings available in ALL of these categories.

If you do all of these things, you can save up to 50% on your home energy costs!

REALLY!

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Chapter Fifteen - Rebates, Tax Credits, and other Subsidies

Federal Tax Credits for Radiant Barriers

Providing Consumers Tax Credits in 2009-2010 for Radiant Barriers Purchased and Installed in 2009-2010

The American Recovery and Reinvestment Act of 2009

On February 17, 2009, President Obama signed "The American Recovery and Reinvestment Act of 2009" that made some significant changes to the existing energy tax credits that apply to radiant barriers. The highlights are:

- The tax credits that were previously effective for 2009, have been extended to 2010 as well.
- The tax credit has been raised from 10% to 30%.
- The maximum credit has been raised from $500 to $1500 for the two year period (2009-2010) for all improvements combined.

Radiant Barrier Tax Credit Summary:

- For a radiant barrier to qualify, its primary purpose must be to insulate.
- must be "placed in service" from January 1, 2009 through December 31, 2010
- must be for taxpayers principal residence
- improvements made in 2009 will be claimed on your 2009 taxes (filed by April 15, 2010) — use IRS Tax Form 5695 (2009 version) — it will be available late 2009 or early 2010
- For tax purposes, save your receipt and the Manufacturer's Certification Statement.
- Must be expected to last 5 years OR have a 2 year warranty.
- Installation costs are not included.

Emergency Economic Stabilization Act of 2008

On October 3, 2008, President Bush signed into law the "Emergency Economic Stabilization Act of 2008." This bill extended tax credits for energy efficient home improvements (windows, doors, roofs, insulation, HVAC, and non-solar water heaters). Tax credits for these residential products, which had expired at the end of 2007, will now be available for improvements made during 2009. However, improvements made during 2008 are not eligible for a tax credit.

Radiant Barrier Tax Credit Summary:

- For a radiant barrier to qualify, its primary purpose must be to insulate.
- Must be expected to last 5 years OR have a 2 year warranty.
- Installation costs are not included.
- Manufacturer's Certification Statement required.
- For tax purposes, save your receipt and the Manufacturer's Certification Statement.
- Use IRS Form 5695.
- Must be "placed into service" between Jan. 1–Dec. 31, 2009.

If all conditions are met, the tax credit is provided in the amount of 10% of the product cost (not including installation costs) up to a maximum of $500.

Energy Policy Act of 2005

On August 8, 2005, President Bush signed into the law the Energy Policy Act of 2005 offering consumers tax credits for various home improvements made to save energy.

Tax credits (Section 25C) are available for many types of **home improvements** including adding insulation, replacement windows, and certain high efficiency heating and cooling equipment to non-business energy property that is:

- installed on or in connection with a dwelling unit located in the United States and used as the taxpayer's principal residence;
- originally placed-in-service by the taxpayer after December 31, 2005, and before January 1, 2008; and
- expected to remain in use for at least 5 years.

Credit amount is equal to 10% of the amount paid for qualified energy efficiency improvements installed during the tax year. The maximum amount of homeowner credit for all improvements combined is $500 during the two-year period of the tax credit.

These Section 25C credits are taken on IRS Form 5695 and may not be carried forward to future tax years.

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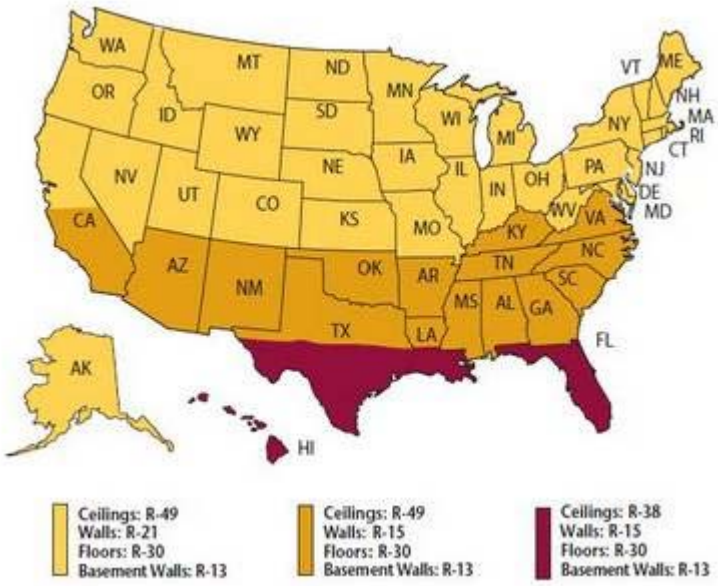
Definition: Tax "credits" are subtracted directly from total tax liability resulting in a dollar for dollar reduction of taxes due. If you have no tax liability for the year, then you do not get credit for the tax benefit.



The tax credit applies only to improvements made to the building envelope since they affect energy use. The envelope is defined as the area along the perimeter of the home that separates the living space from the outside. This includes attics, foundation and exterior walls, basements and crawl spaces.

Is there a specific time frame in which I need to make energy efficiency improvements in order to be eligible for the tax credit?

Consumers who want to take advantage of the Federal tax credits for their homes must install the products between January 1, 2009 and December 31, 2009.

How do I get a tax credit for insulation?

The tax credit for existing homes requires that the building envelope component being renovated must meet the energy efficiency minimum standards outlined in the 2001 or 2004 International Energy Conservation Code (IECC). The envelope is defined as the area along the perimeter of the home that separates the living space from the outside.

This includes attics, foundation and exterior walls, basements and crawl spaces. Insulation is a key component of the home or building envelope. Other qualified envelope components include windows (limited to a maximum credit of $200),

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doors, skylights and air duct sealing. EPA's ENERGY STAR Home Sealing Program offers consumers advice on how to improve their building envelope. Adding fiberglass or mineral wool insulation is one of the fastest and most effective ways to save energy in your home. Insulation and home sealing can save up to 20% on energy use according to the U.S.EPA.

Savings vary. Find out why in the seller's fact sheet on R-values. Higher R-values mean greater insulating power. This is an investment that keeps paying off with better comfort and energy savings for as long as you own your home.

Do I still get the tax credit if I hire a professional contractor to add insulation?

The IRS guidance states that only the cost of the insulation products is eligible for the tax credit, and installation fees are not eligible. That said, there are many good reasons to hire a contractor, such as installation of loose-fill insulation, to ensure proper installation and if you do not have the skills or interest to do the job yourself. Make sure the contractor gives you an itemized receipt that breaks out the cost of the insulation from the labor charge.

What paperwork will I need to produce at tax time in order to be eligible for the tax credit?

Check with the IRS for complete information. Generally, an itemized retail or contractor receipt showing the amount spent on insulation materials between January 1, 2009 and December 31, 2009, along with a certification document from the insulation manufacturer should meet the requirements.

http://www.irs.gov/newsroom/article/0,,id=154657,00.html

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Chapter Sixteen - Automatic Financing Program

PAY FOR ALL YOUR ENERGY PROJECTS WITHOUT TOUCHING A PENNY OF YOUR PRIMAR INCOME. HERE'S HOW…

For every sale you make as an affiliate, you get $52.70 (at a $97 retail sell)

Make sure to sign up for the ***Save On Home Energy*** mailing list.

2 referrals pays for your own copy of this E-book!!!! This is your first goal!
4 referrals pays you enough to insulate your hot water heater and refrigerator!
6 referrals gets you 700 sq feet of the PRODEX radiant barrier ($300)
8 referrals gets you a heat pump hot water heater ($400)
50 referrals earns you enough to replace ALL of your windows with the best insulating windows available for the average home.

Save On Home Energy

Clickbank Affiliate Program

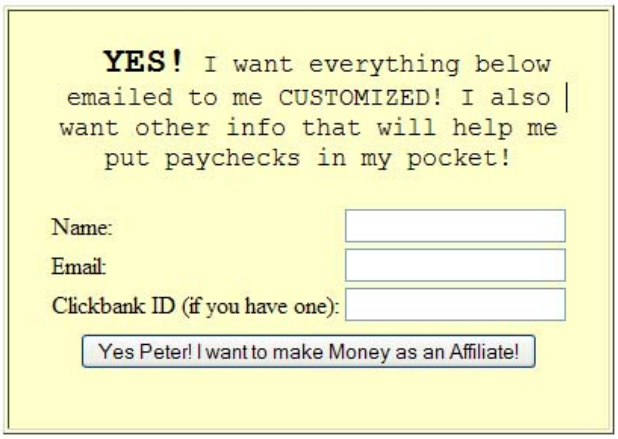
"HUGE Affiliate Opportunity! Earn 60% Commissions On This INCREDIBLY HOT E-book."

(Get Paid Every 7 Days Like Clockwork from ClickBank With Their New Weekly Pay Out Scheme.)

Dear Friend,

Thanks for becoming an affiliate for
Save On Home Energy!

This is not the actual form, when you get to the page, it looks like the picture below.


YES! I want everything below emailed to me CUSTOMIZED! I also want other info that will help me put paychecks in my pocket!
Name:
Email:
Clickbank ID (if you have one):
Yes Peter! I want to make Money as an Affiliate!

NOTE: Even if you are NOT a Clickbank affiliate, fill out the form above to get the complete inside scoop on this affiliate program as well as hundreds of dollars worth of online marketing tools.

BACK TO SALES PAGE FOR SAVE ON HOME ENERGY

Your Affiliate Link

This is your affiliate link. Copy it and whenever you paste that link, make sure to replace the xxxxx with your Clickbank nickname.

If you do not have one click here now to get one.

```
http://xxxxx.emedia123.hop.clickbank.net
```

The "***Save On Home Energy***" ebook has just been released on the Clickbank marketplace!

The **selling price of the ebook is $47 and you earn 60%** after Clickbank take their fees.

You earn $52.70 per sale.

Banners you can use on your website

Below is a selection of banners in different sizes. Feel free to use them on your website.

You can also use them in banner exchange programs. I've listed some of the most effective ones below. Clicking on each one will open a new window

Click4Click.com

The Banner Exchange

Exchange Ad

Banners Go MLM

Remember link from the banners with your affiliate link. Replace the xxxxx with your clickbank nickname

```
http://xxxxx.emedia123.hop.clickbank.net
```

How to save banners to your computer

Right click, select "Save Target As" and save the banners below

468x62

275x82

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This one is for Banners Go MLM
250x72

176x170

Book Cover
300x389 (resize it as needed)

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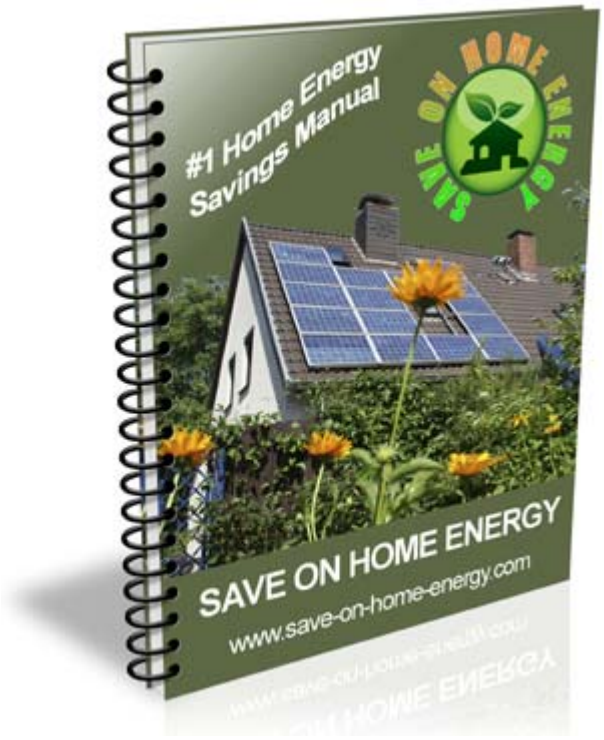

3D Book Cover
300x368 (resize it as needed)

Articles you can use on your blog, newsletter or website

Below in an article you can reproduce on your blog, website or newsletter. Just replace the xxxxx with you Clickbank ID.

BACK TO SALES PAGE FOR SAVE ON HOME ENERGY

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Email Signature Ad Copy

Add these email signatures to your outgoing emails. If you are running an email promotion you can add them as a PS section.

Of if you make a post in marketing forums add your signature there as well.

Email Sig #1

```
Massively Slash Your Power
Bills!

http://xxxxx.emedia123.hop.c
lickbank.net
```

Email Sig #2

```
Cut Home Energy Costs!

http://xxxxx.emedia123.hop.c
lickbank.net
```

Email Sig #3

```
Home Energy Saving Secrets!

http://xxxxx.emedia123.hop.c
lickbank.net
```

Email Sig #4

```
Get Your Blackbelt in Home
Energy Savings

http://xxxxx.emedia123.hop.c
lickbank.net
```

Ezine Advertising Outlets

Use the ad copy below for your own ezine or pay for advertising in other people's.

Here is a list of good ezine outlets.

Cash From Home

Super Promo

Admistress Advertising

Rim Digest

SCOOP Ezine

BizSiteBiz Ezine

Premier Opt In

BACK TO SALES PAGE FOR SAVE ON HOME ENERGY

Ezine Solo Ad Copy

Use this solo ad copy for advertising in the ezines above. Or you can use it in your own ezine. Feel free to modify the ad copy ad you see fit.

Just copy the solo ads from the boxes below

Your affiliate link is below. Replace the xxxxx with your Clickbank nickname

http://xxxxx.emedia123.hop.clickbank.net

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Ezine Solo Ad #1

Subject: Stop turning your thermostat down!

Dear Subscriber,

I've got a quick question for
you today...

Are you fed up with alternative energy and conservation experts that insult your intelligence by asking you to turn down your thermostat to 68 degrees so you don't use as much energy in the winter?

They say to put on a sweater and that is supposed to save energy? Unless I'm living in a barn, I don't think I'm going to be using a sweater to save energy because in my own home, I like to know that I'm comfortable no matter what I wear...that is the point of having a home.

Do you actually know how hard they're laughing out loud while rolling on the floor at the fact that they're making people shiver in the ***"comfort"*** of their own home? If there is ever an oxymoron, this is it.

I mean, how ridiculous can they get?

What I want to tell you is something nobody else is going to tell you. You don't need to turn your thermostat down anymore and please don't get trapped into using a complete waste of money called a water heater jacket. None of these things as well as just about everything else you've been told is going to do you any good!

If you really want to cut through the misinformation quickly, go here:

http://xxxxx.emedia123.hop.clickbank.net

Many thanks,
YOUR NAME

Ezine Solo Ad #2

```
Subject: Revealed - Everything you think you know
about saving energy at home is probably wrong!

Dear Subscriber,

Have you heard that to save energy you need to put
a sweater on and turn your thermostat down in the
winter?

Unless you live in an igloo, what's the point?

The bottom line is this... you've been lied to over
and over throughout the years by the power
companies, the green building industry and all
these wannabe green thinkers.

Let's get to the bottom line... you want to save
money on your home energy bills and if you're not
doing this soon, you'll be paying big later...not
too much later either.

If you're ready to finally for once in your life
learn the truth to home energy savings, go here
now:

http://xxxxx.emedia123.hop.clickbank.net

Thanks,
YOUR NAME
```

Top Sponsor & Classified Ad Copy

Below are top sponsor and classified ads you can use. Remember there are a ton of places to advertise located at our ezine advertising outlets section.

Top Sponsor/Classified Ad #1

```
You'll be laughing at people for
turning their thermostat down to
save money on their home energy
bill!
http://xxxxx.emedia123.hop.clickbank
.net
```

Top Sponsor/Classified Ad #2

```
Revealed: How not to have your
intelligence insulted by experts
that tell you the way to save money
is by shivering in your own home!
http://xxxxx.emedia123.hop.clickbank
.net
```

Top Sponsor/Classified Ad #3

```
GO GREEN! Easy way to turn your
neighbors green with envy as you
show them how you saved 50% on your
power bills and made money doing it!
http://xxxxx.emedia123.hop.clickbank
.net
```

Google Adwords Ad Copy

This has been our most successful Google Adword ad to date. There are MANY keywords on our affiliate page.

Cut power bills in half
Learn the untold Secrets
they don't want you to know!
save-on-home-energy.com

Press Releases and how to send them

Sending a Press Release can be a great way to get ongoing sales for a one time payment.

Simply go to PrWeb.com and submit your press release here.

NOTE! Please change the wording below or else it will look like the same as everyone else. Add in more 3-4 lines paragraphs if you wish

---

Instant Buzz Ads

Instant Buzz is an excellent traffic service that gets you quality traffic for no cost. There is an option to buy 40,000 advertising credits for as little as $50. If you can afford this I highly recommend this.

Make sure you watch the video above for a tutorial.

Click here to join Instant Buzz for free

Instant Buzz Ad #1

Home Energy Saving Secrets

Instant Buzz Ad #2

Save On Home Energy

BACK TO SALES PAGE FOR SAVE ON HOME ENERGY

See you at the top!

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Chapter Seventeen - Resources

Resources

http://www.school-for-champions.com/science/thermos.htm

http://vodpod.com/watch/1270032-just-how-safe-are-cfl-light-bulbs

http://hes.lbl.gov/

http://www.energysavers.gov/

http://www.thermalvisions.com/index.html

http://www.igloothermal.com/index.htm

http://www.speedheat.us/index.html

http://www.ecovativedesign.com/products.html

http://www.greenplug.us/index.php

http://www.coopamerica.org/pubs/caq/articles/summer2008/LevelOne.cfm

HyTech Sales (ceramic paint additive)

http://www.ecobulb.com/us/

Insulation 4 Less – PRODEX Radiant Barrier

http://www.eia.doe.gov/fuelelectric.html

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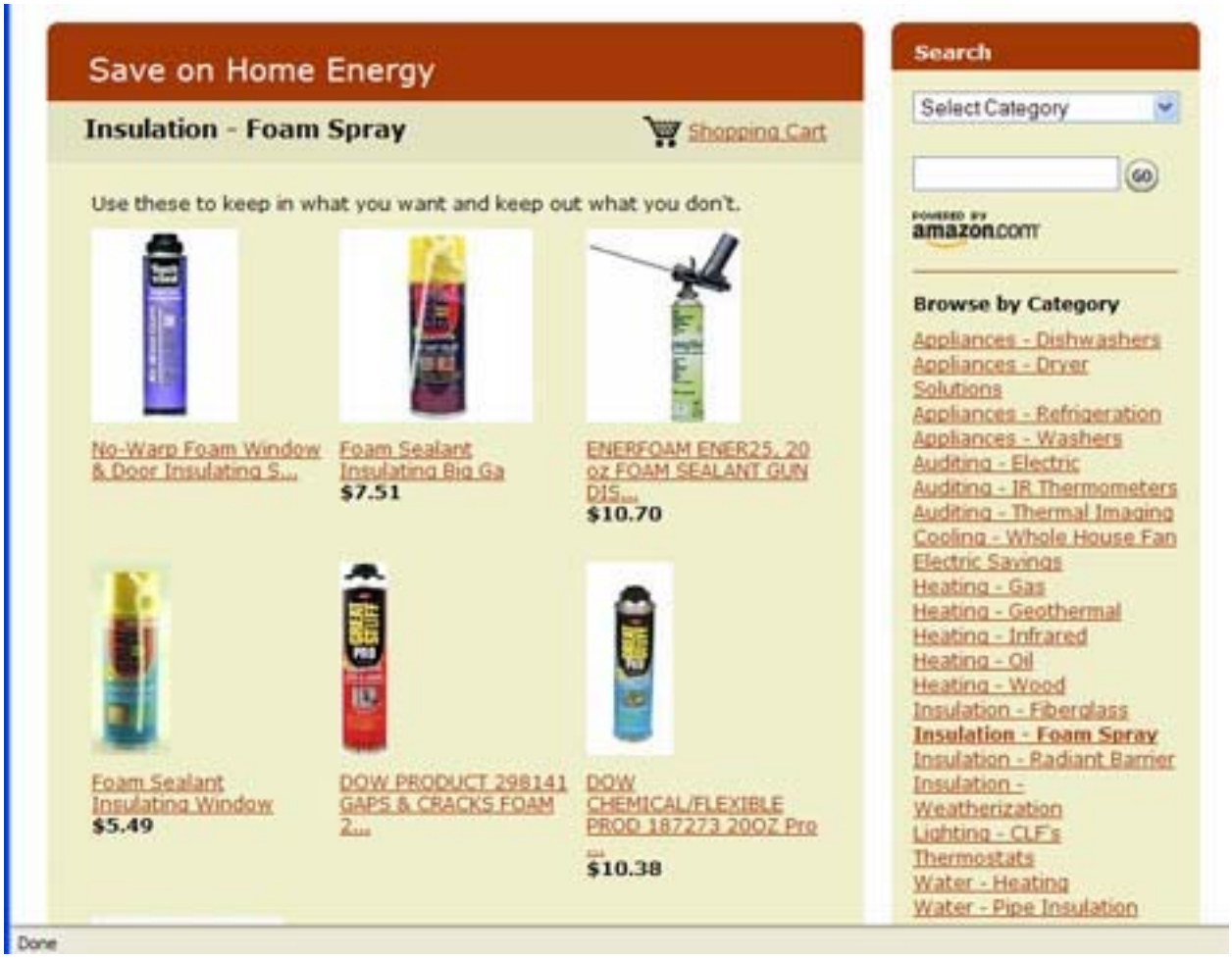

Visit

Save On Home Energy's Amazon Store

http://astore.amazon.com/saveonhomeenergy-20

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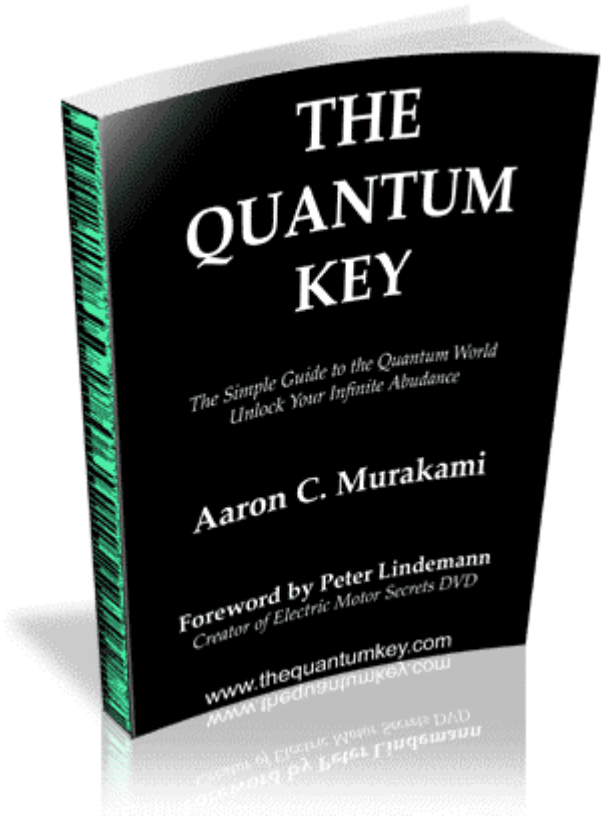
THE QUANTUM KEY
The Simple Guide to the Quantum World
Unlock Your Infinite Abudance
Aaron C. Murakami
Foreword by Peter Lindemann
Creator of Electric Motor Secrets DVD
www.thequantumkey.com

“See why the "nay-sayers" are losing their followers. Unlock *your* disbelief with...”

The Quantum Key

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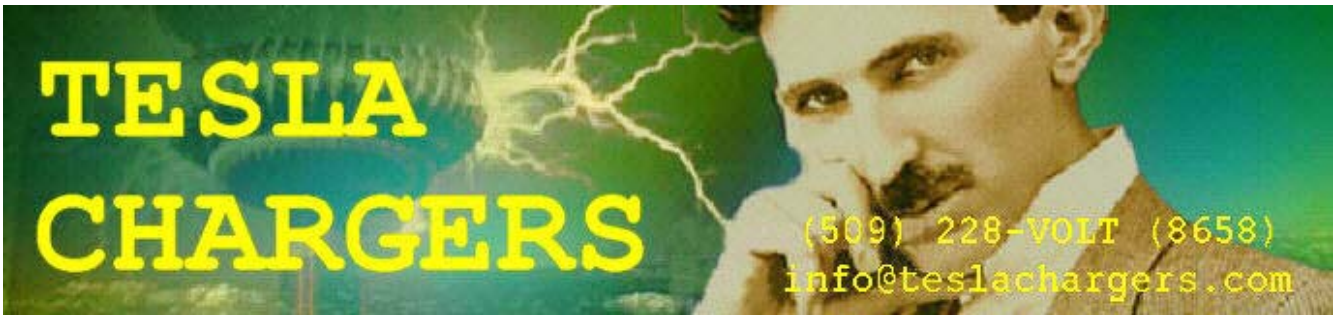

Tesla Chargers

The Most Efficient, Effective & Advanced Battery Chargers in the World

Stop throwing things away just because the rechargeable batteries fail.

Now, there is a SOLUTION!

Now you can Recharge and Restore all of your batteries, from a 1.5 Volt AAA battery, all the way up to the full-sized Electric Car.

"It has been running 3 days and the voltage is still 12.5!"

"It cost me half the money compared to the conventional trickle charger to get 3 hours and ten minutes longer run time."

"I saw a 15% increase in run time using a load over just the last charging."

www.TeslaChargers.com

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Quantum Intention World Peace Project

USE IT NOW: WORLD PEACE PROJECT

This Humanitarian Project was created based on the discoveries from PEAR's (Princeton Engineering Anomalies Research) research findings that conscious intention can affect the physical world.

It's FREE – GET STARTED NOW!

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the power of nature
E3Live™ is a superfood that does more than just raise energy levels and increase mental clarity...
E3Live™
discover for yourself how E3Live™ can target hidden nutritional deficiencies and detoxify your body.
E3Live
Fresh-Frozen
Aphanizomenon flos-aquae

THE PERFECT BRAIN FOOD

Mental Clarity – Mood
Relaxation - Mind Power

To learn more, click below

E3LIVE

Aphanizomenon flos-aquae

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Ceramic Paint Additive

Insulating Paint Additive

Reflects up to 90% of the heat back to the source

Insulate your home with a stroke of a brush

Based on NASA Technology

Can be mixed into any locally available house paint

Keep heat out in summer and reflect the heat back in during the winter

Drastically reduce the cost required to heat and cool your home

Add it to your own paint or get it pre-mixed

Ceramic Paint Additive

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Get More Magnet for Less Money!

All Sizes

All Strengths

All Types

MAGNET 4 LESS